PRICE 50 CENTS

NOVEMBER 9, 1953

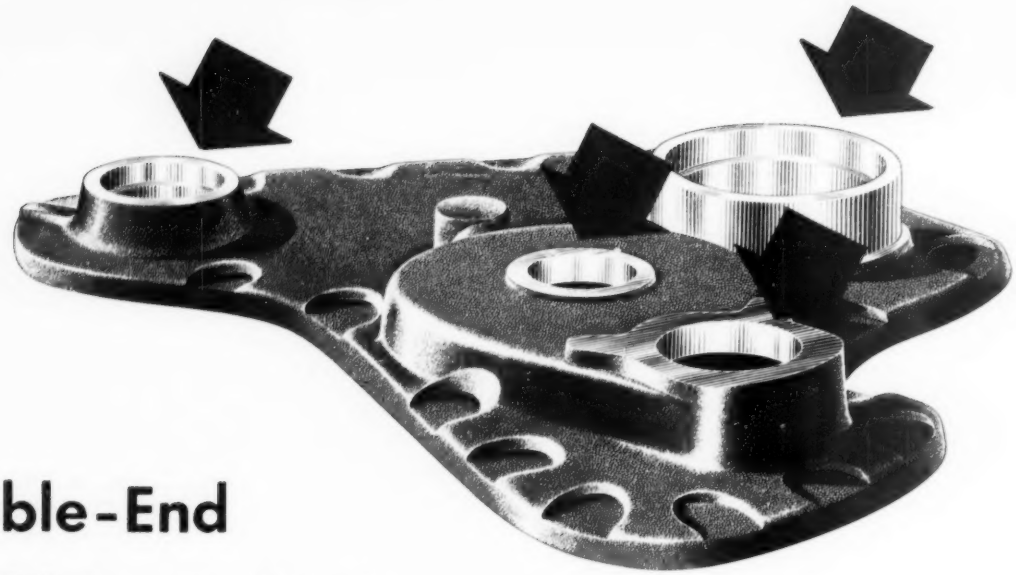
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING-PRODUCTION

Intricate parts to 0.0004
see page 2

Automatics Replace Handcraft Skills

Apprentice Training — A SPECIAL REPORT



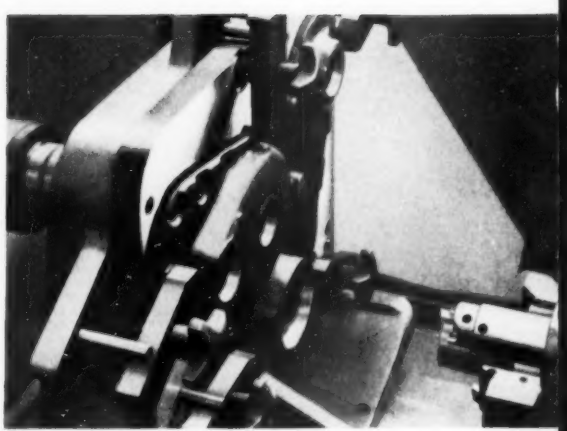
Double-End Heald Bore-Matic does a 5-HOUR JOB

in 12 MINUTES

● Precision finishing the four bearing holes in this gear case cover used to be a 5-hour job — requiring separate operations on different machines. But now it's done in *12 minutes flat* — on a single Heald Model 322 Bore-Matic. That's a saving of 4 hours and 48 minutes per part!

All operations, including boring, facing, chamfering and turning, are performed at a single loading, in one high-speed automatic cycle. Four boringheads are used — one on the left-hand bridge and three on the right. The work is automatically presented to the two sets of heads in sequence, after which it returns to center for reloading.

Remember — when it comes to precision finishing, it pays to come to Heald.



Internal and Rotary Surface Grinding Machines and Bore-Matics

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MAGAZINE OF METALWORKING PRODUCTION

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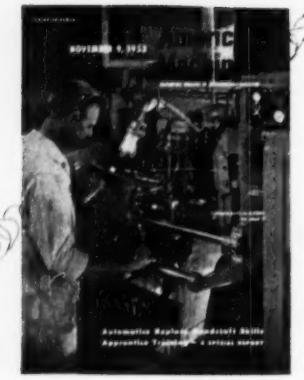

chips

AUTOMATIC . . . Hawk-Eye Works of Eastman Kodak Co, Rochester, NY, has recently shifted from hand to automatic production of lens parts for camera lenses. Our cover, taken by and at this Eastman plant, shows a 5-spindle Warner & Swasey automatic lathe turning out rear lens mounts. There's only one setup, tolerances are 0.0004 in. for accuracy, as well as close for squareness and concentricity. Yield is up 95% and skilled men have been transferred to other jobs. The detailed story is our lead article.

APPRENTICESHIP . . . We've felt you should have a handbook on apprenticeship so you could consider the subject objectively. Associate Editor Sheets has been digging into the subject for months, now comes up with a 24-page Special Report that is the latest word. It summarizes the NTDMA plan, gives variations by typical companies provides the information essential for setting up a plan. Reprints will be available.

TOOLING . . . Four short articles provide some of this issue's information on tooling. First, there's an article by David Worth, tool engineer at South Park Tool & Mold Co, Inc, showing how to grind master involute gears . . . Then, Patrick Gribbin of Kennametal describes how to wed "soft" carbides and old machine tools to increase productivity. This grade of carbide can absorb shock, hence can handle interrupted cuts with heavy feeds at slow speeds . . . Third, we've a spread of pictures of talented tooling, including a whirling flame-hardening fixture for ring gears, a helix-forming attachment on a cutter grinder, a spring cushion for a Bullard toolblock, a horizontal press to pierce jet-engine cone rings, and two pointers on wrench hardening and cutting a large screw . . . Fourth, we've a page of shop shots from Walter Kidde & Company that will give you some ideas.

UNIVERSAL WELDER . . . E F Davis of Westinghouse (see biog) tells us of a new and highly ingenious machine that makes it possible to do submerged-arc welding on even a single assembly. The secret is the ability to do without costly fixtures.

RYAN . . . We've had several ideas from Ryan Aeronautical Co recently. Now from San Diego comes two added ideas. One shows the largest hydraulic expanding mandrel — a hydraulic press with a side action that bulges radial-engine nacelles, fuel-tank sections and like compound-curved parts to shape. Both aluminum and stainless are formed in this 4800-ton machine . . . The other describes Rotoblast finishing. There are two good sets of before-and-after photos, explanation of a Ryan-developed detergent, a list of stone materials. Large parts are fixtured for tumbling.

COMING . . . Nov 23 *AM* has a spectacular Special Report on How to Rebuild Burned-Out Machine Tools. Based on experiences growing out of the recent fire at the Livonia, Mich, plant of GM, it describes post-fire organization, steps in rebuilding, and potential building and method changes for greater plant protection. There is also an article on the world's most accurate measuring instrument, and other features.

BUT BEFORE THAT . . . The next issue you should receive is our 1954 Production Planbook, a premium issue that will total over 700 pages of all available data on replacement and modernization, classified by subject, and with the added feature of our latest Inventory of Metalworking Equipment. Don't miss this one, if you want to make your plant efficient and cut your production costs.

EXPERT WELDER—Edward F Davis, author of the article on submerged-melt welding (p 126) this issue, has been wrestling with welding problems for almost all of his 25 years with Westinghouse Electric. For 10 years prior to 1952 he was a member of the Metals Joining Laboratory, which is Westinghouse's testing and consultant welding organization that serves the entire company. In 1952 he became consultant manufacturing engineer in the company's Headquarters Manufacturing Engineering Department. He is a member of American Welding Society.

COMING IN MID-NOVEMBER

The 1954
PRODUCTION PLANBOOK
for Metalworking

including the Seventh
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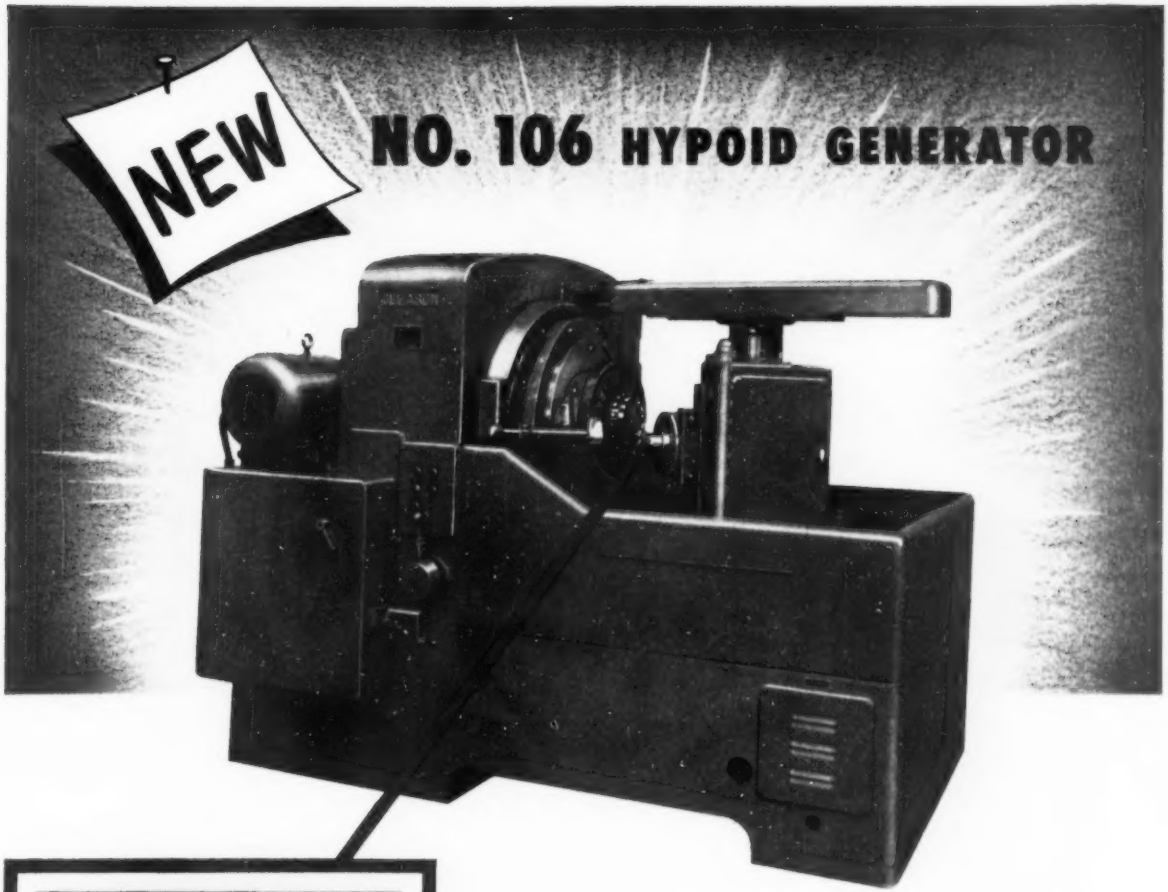
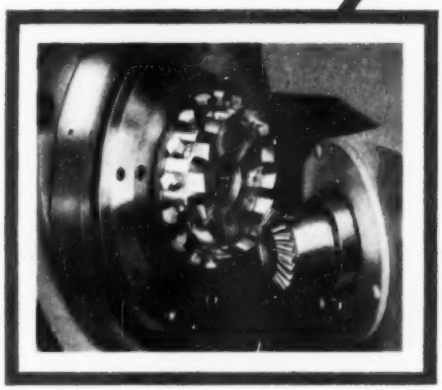
Inventory of Metalworking
Equipment

Watch for your copy . . .

NEW NO. 106 HYPOID GENERATOR





This tractor belt pulley drive gear, 25 teeth, 7 D P, 11/16" face, 8620 steel, is completed in one operation at 14.6 sec. per tooth, 5.8 min. floor-to-floor time.

. . . For cutting spiral bevel, ZEROL® bevel, and hypoid gears up to 4 D P, 8½" diameter, 1¼" face

This versatile machine is ideal for small quantities or mass production of gears in the above size range. Greatly increased production rates are assured, because of its improved features, including cam-actuated generating motion, and rigid new-type cutter spindle construction. Many gears which previously required separate roughing and finishing cuts can now be completed in one operation, with marked savings in floor-to-floor time and handling time per piece.

Send prints of your bevel gears for an analysis of the cost savings this new generator can offer you.

GLEASON

GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

1000 UNIVERSITY AVE. · ROCHESTER 3, NEW YORK

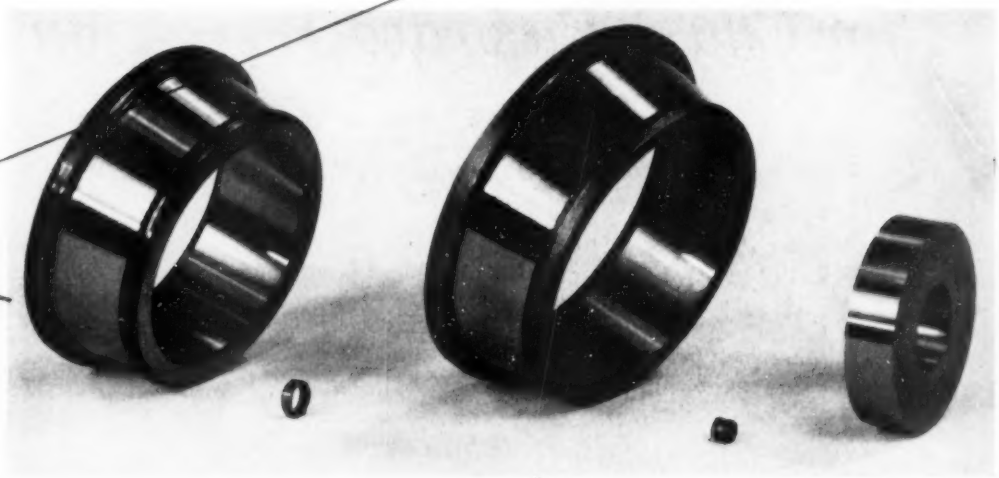
PLUS or MINUS *a Light*

FILMATIC

CINCINNATI Micro-Centric Grinding Machines are made in two sizes, Nos. 1 and 2.

wave

Examples of the work ground on CINCINNATI Micro-Centric Grinding Machines. Many parts of similar shape can be ground on the Micro-Centric.



Precision of a lightwave has been taken out of the laboratory and put to work in the production line. CINCINNATI FILMATIC Micro-Centric Grinding Machines turn the trick by grinding anti-friction bearing parts and similar components to accuracies of squareness and roundness within 25 millionths of an inch! The work is neither clamped nor chucked.

A new principle, employing a drive plate to rotate the work through skiving action, does two things: (1) rounds up the work to an accuracy never before approached by grinding, and (2) grinds the diameter exactly square with one face. The grinding cycle is automatic, and the machines can be equipped for fully automatic operation, including loading, unloading, wheel dressing, and periodic compensation for size. ¶For brief details look in Sweet's Machine Tool Catalog.

CINCINNATI

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

CINCINNATI GRINDERS INCORPORATED
(Subsidiary of The Cincinnati Milling Machine Co.)
CINCINNATI 9, OHIO

Announcing
a Fine-Pitch
for Chart-Recorded Inspection of

- **Records "composite errors" on chart . . . magnified 200x, 400x or 800x**
- **1/10,000-inch dial indicator for visual inspection**
- **Capacity to 4" p.d. . . . 20 pitch and finer . . . external or internal**
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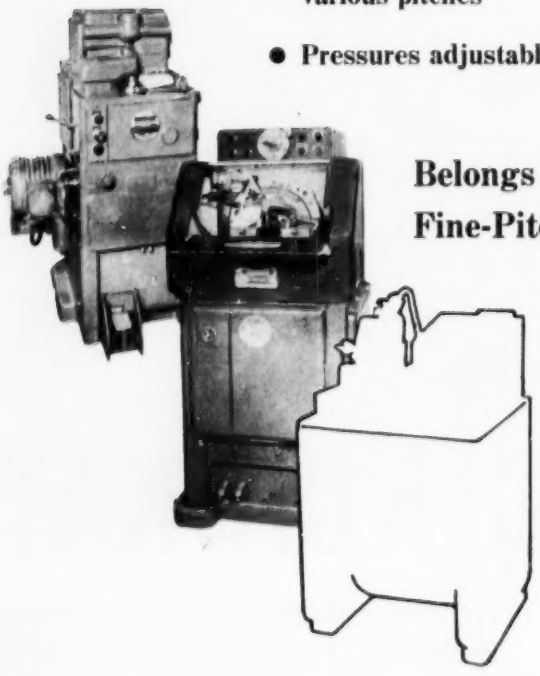
- **Speeds variable to maintain maximum measuring speed for various pitches**
- **Pressures adjustable to conform to AGMA specifications**



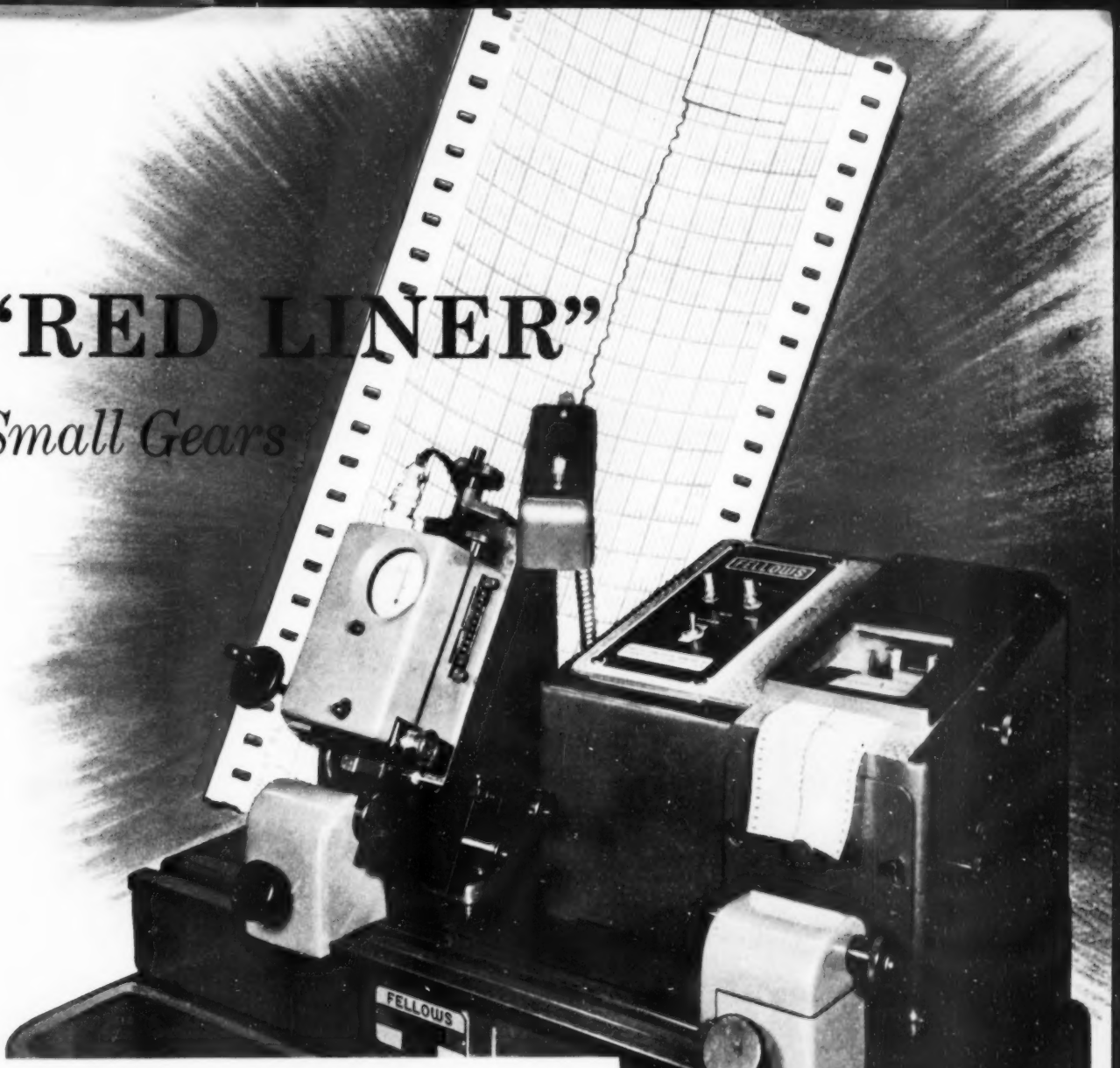
Belongs in Every Fine-Pitch Gear Cutting Layout

A third member of the Fellows Fine-Pitch team! A place should be waiting for it wherever the Fellows 3-Inch Fine-Pitch Gear Shaper and/or No. 4 Fine-Pitch Shaving Machine are in use.

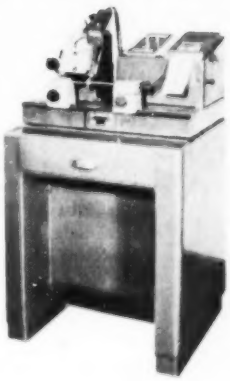
THE *Fellows*

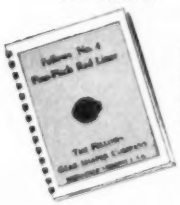
"RED LINER"

Small Gears



The ease, speed and simplicity of "Red Liner" inspection can improve quality control and add to your profit. Fellows service also includes making the hardened and precision ground Master Gears.





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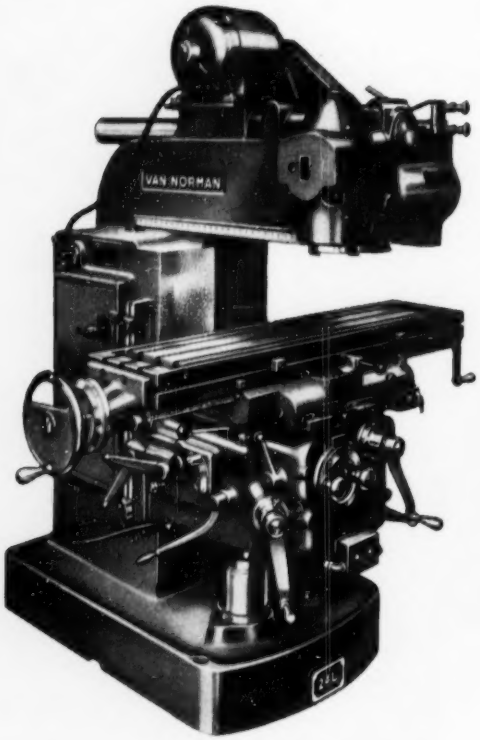
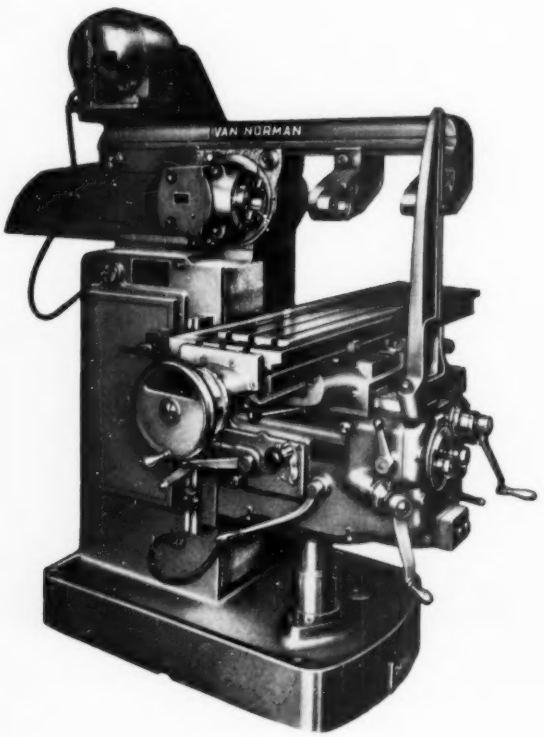
VAN



No. 24 L

Cutterhead in Vertical Position
Table: 45″ x 10½″
Ram Travel: 29″

9 Speeds: 50 to 1400 R.P.M
Spindle Motor: 3 H.P.
Feed Motor: 1 H.P.
Approximate Weight: 3700 lbs.



No. 24 M

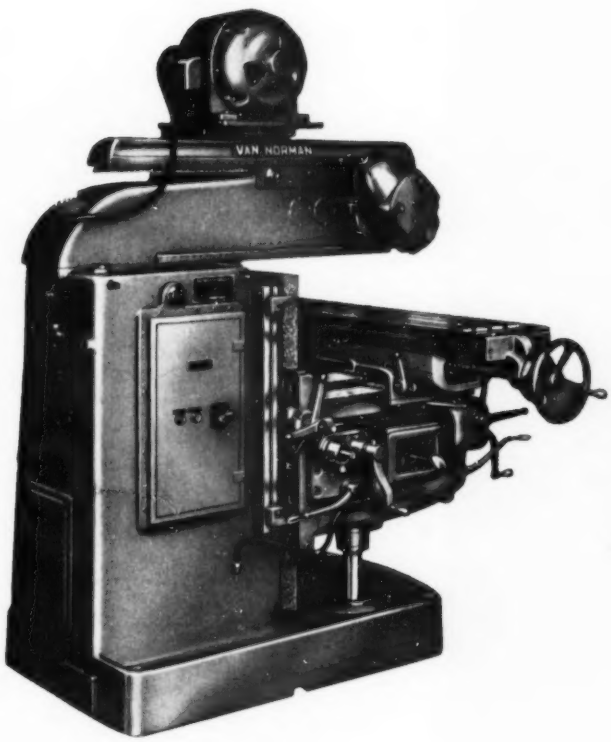
Cutterhead in Horizontal Position
Table: 50″ x 12″
Ram Travel: 25″

12 Speeds: 40 to 1600 R.P.M.
Spindle Motor: 5 H.P.
Feed Motor: 1 H.P.
Approximate Weight: 4000 lbs.

VAN NORMAN COMPANY, SPRINGFIELD 7,

NORMAN Ram Type Millers

Each Designed to Provide Greater Versatility, Cut Milling Costs:



No. 28

Cutterhead in Angular Position
Table: 58″ x 13″
Ram Travel: 29″

12 Speeds: 40 to 1600 R.P.M.
Spindle Motor: 7½ H.P.
Feed Motor: 1½ H.P.
Approximate Weight: 6300 lbs.

No. 38 M

Cutterhead in Horizontal Position
Table: 64″ x 14″
Ram Travel: 29″

12 Speeds: 35 to 1400 R.P.M.
Spindle Motor: 7½ H.P.
Feed Motor: 1½ H.P.
Approximate Weight: 7200 lbs.

MASS.

These new Van Norman Millers feature the famous adjustable cutterhead which permits conventional horizontal and vertical as well as angular milling on one machine. They have been completely designed and engineered to provide utmost accuracy plus long operating life.
Write for complete information.

From— THE ORIG

The Original Landis Die Head
Built by H. R. Landis,

1889

From one die head built in 1889 based on a revolutionary new principle in generating threads, to 350 sizes and styles is the story of Landis Die Heads and Collapsible Taps—the widest line in range and application in the world today.

The constant research for better threading methods which has brought to Landis leadership in its field today plays an even more important part in our activities. On the record of the past stands our promise for the future.

We offer all manufacturers our years of experience in all phases of Threading. If you have a problem involving threads, whether design or production, or if you feel that your present threading methods should be improved, call on Landis.

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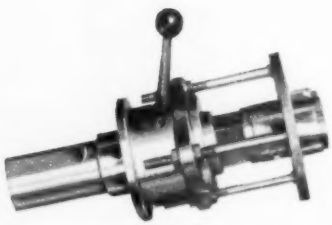
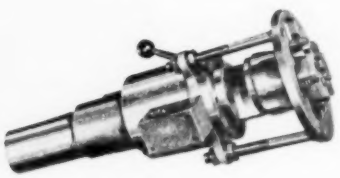


STYLE ALT
COLLAPSIBLE TAP



STYLE LL
RECEDING COLLAPSIBLE TAP

SOLID ADJUSTABLE TAP

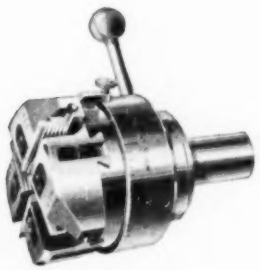
50 58

LANDIS Machine

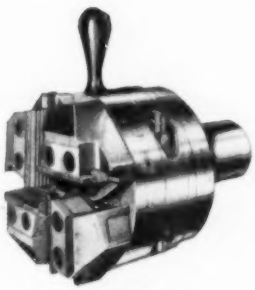
THE WORLD'S LARGEST EXCLUSIVE

INAL LANDIS DIE HEAD . . . .

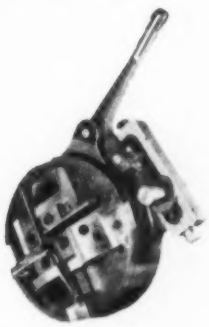
LANDIS THREADING TOOLS FOR EVERY THREADING JOB - - -



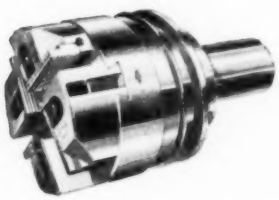
LANDMATIC HARDENED AND GROUND HEAD



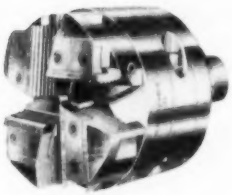
LANDMATIC HEAT TREATED HEAD



LANSTA HEAD

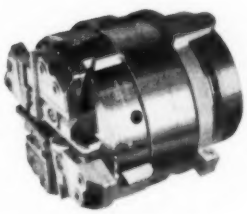


LANDEX HAR ..ED AND GROUN.. HEAD

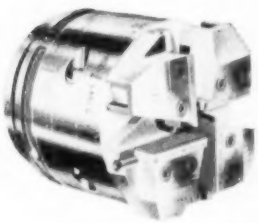


LANDEX HEAT TREATED HEAD

SOLID ADJUSTABLE HE..



LANCO HARDENED AND GROUND HEAD



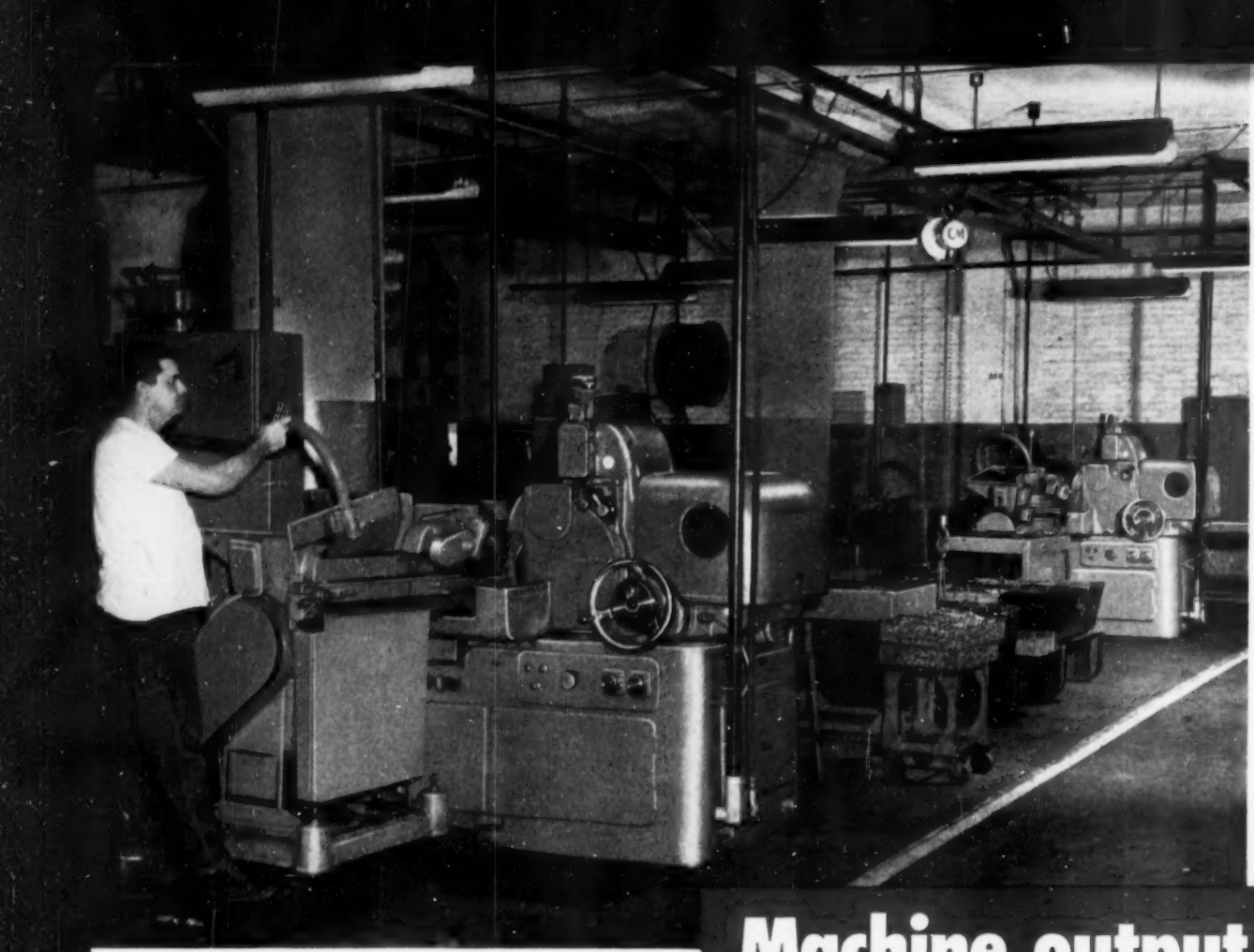
LANCO HEAT TREATED HEAD

THE LANDIS CHASER

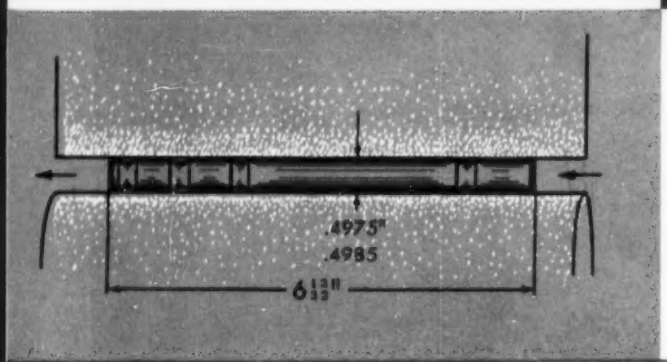
The Finest Thread Cutting Tool In Industry

COMPANY LANDIS **WAYNESBORO PENNSYLVANIA**

MANUFACTURERS OF THREAD GENERATING EQUIPMENT



Machine output



work data

Part	Steel gearshift rail
Machine	2 Landis No. 12 Centerless Grinders
Production	600 finished pieces per hour
Stock Removal	.019" roughing .010" finishing
Tolerance	± .0005" on diameter

LANDIS

precision grinders

increased 4 times with modern Landis Centerless Grinders

● **Grinding Costs cut more than 50% at plant of prominent motor car builder.** Big production increases like these mean cost reductions. Modern Landis Centerless Grinders make this possible by faster stock removal while holding the same tolerances.

NEW

2 Landis No. 12 Centerless Grinders
Production—4800 pieces per day.

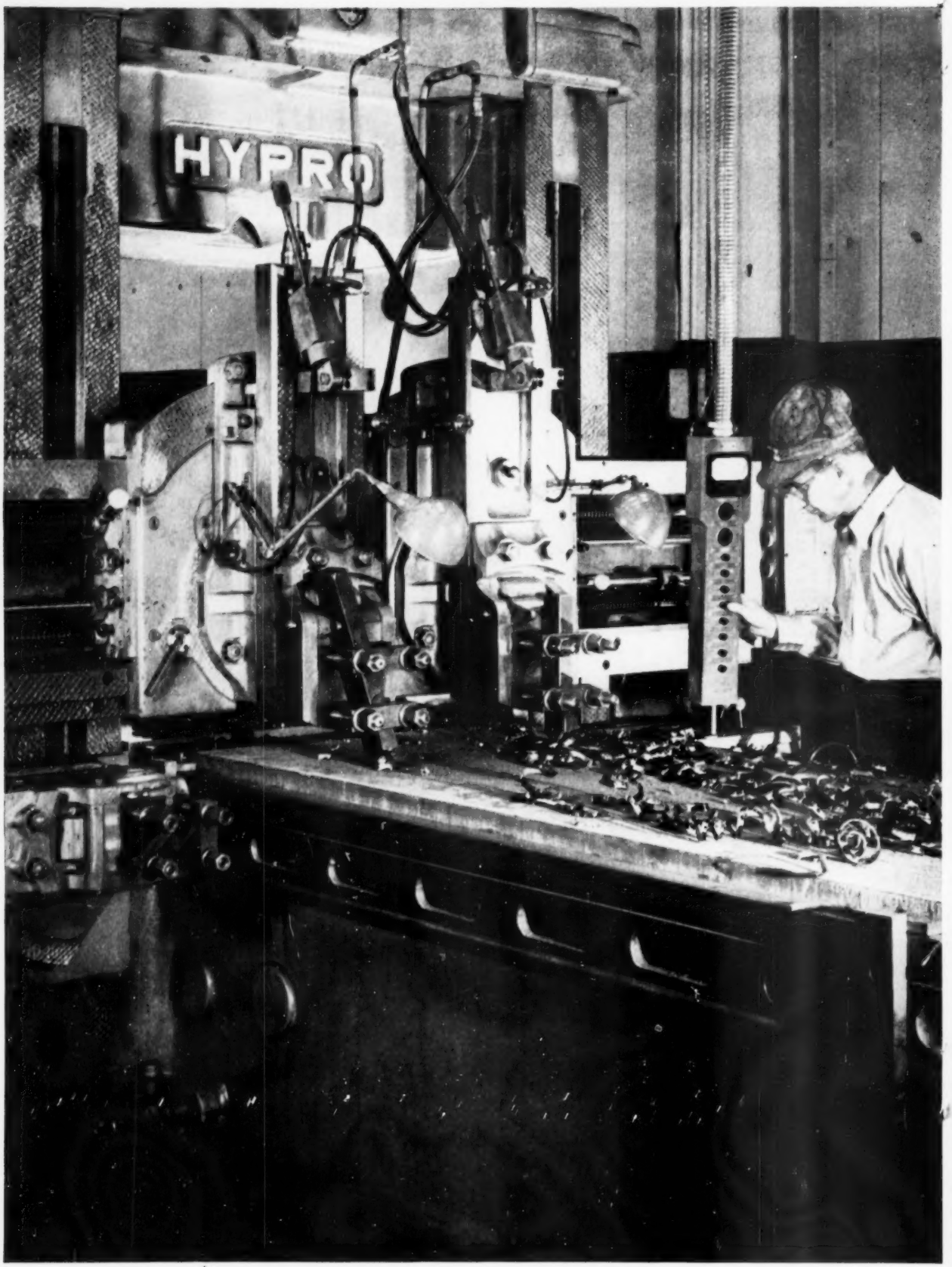
OLD

4 obsolete Centerless Grinders
Production—2300 pieces per day.

Landis Centerless Grinders are designed for accuracy, heavy stock removal, high production and lower grinding costs. Send blueprints for production estimates and tooling suggestions on your grinding jobs.

172

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.


HYPRO

Carbide finger... with the Midas touch!

This G & L Double Housing Planer will help you make a handsome profit on every job, big or small. It has the proper power application and extra rigidity necessary to perform carbide planing operations at 300 ft. per minute

If you're searching for a heavy planer that allows you to get the fastest, most economical use of carbide cutting tools, investigate the G&L line of Double Housing and Open Side Planers.

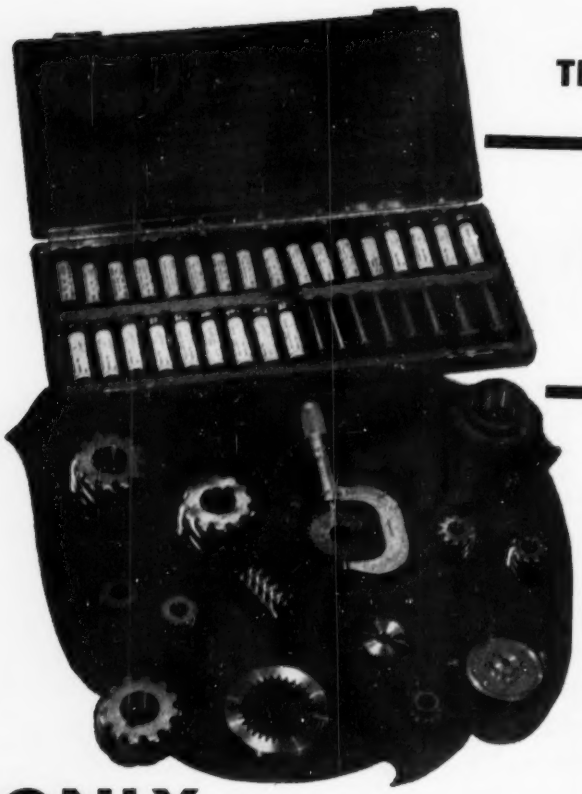
These massive machines offer you many important advantages. In addition to the inherent rigidity of the rail, heads, housings, table and bed — a twin helical gear train table drive provides straight power flow to eliminate side thrust.

G&L HYPRO Double Housing Planers and Open Side Planers are available with working widths up to 144 inches . . . variable voltage drives up to 100 hp . . . bed lengths to suit the particular model. For complete details, see your G&L representative, or write —

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools



THE *Van Keuren* GEAR MEASURING SYSTEM

Set 26EX—Gear Measuring Wires, accurate to ± .000025", for common diametral pitch external spur gears.

VAN KEUREN GEAR MEASURING WIRES PROVIDE THE MOST ACCURATE AND LOW COST METHOD OF MEASURING THE TOOTH THICKNESS OF SPUR AND HELICAL GEARS, INVOLUTE SPLINES AND INVOLUTE SERRATIONS.

ONLY . . . *EQUIPMENT NEEDED:*

1—SET VK MEASURING WIRES
1—MEASURING INSTRUMENT

Complete information regarding the use of Gear Measuring Wires is contained in a 50-page section of the Van Keuren CATALOG and HANDBOOK No. 35. Included in this section are:

- . . . table of wire sizes for the 1.92", 1.728", 1.68" and 1.44" series.
- . . . tables of wire measurement including change factors for standard external and internal spur gears of 14½°, 17½°, 20°, 25°, and 30° pressure angles and of from 5 to 500 teeth.
- . . . table of relationships between depth of cut and tooth thickness for common pressure angle gears.
- . . . definitions and exact formulas covering involute spur gears.
- . . . tables of involute tooth parts for standard addendum and stub tooth involute gears.
- . . . information, formulas and examples regarding the wire measurement of helical gears.
- . . . information and examples concerning the wire measurement of enlarged pinions and reduced gears.
- . . . tables of wire measurement for involute splines.
- . . . tables of wire measurement for involute serrations.
- . . . tables of comparative measurement over three sizes of wires for use in involute profile checking.

CATALOG and HANDBOOK No. 35 is available without charge by writing to: The Van Keuren Co., 173 Waltham St., Watertown, Mass. Ask for your copy.

VK
34th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

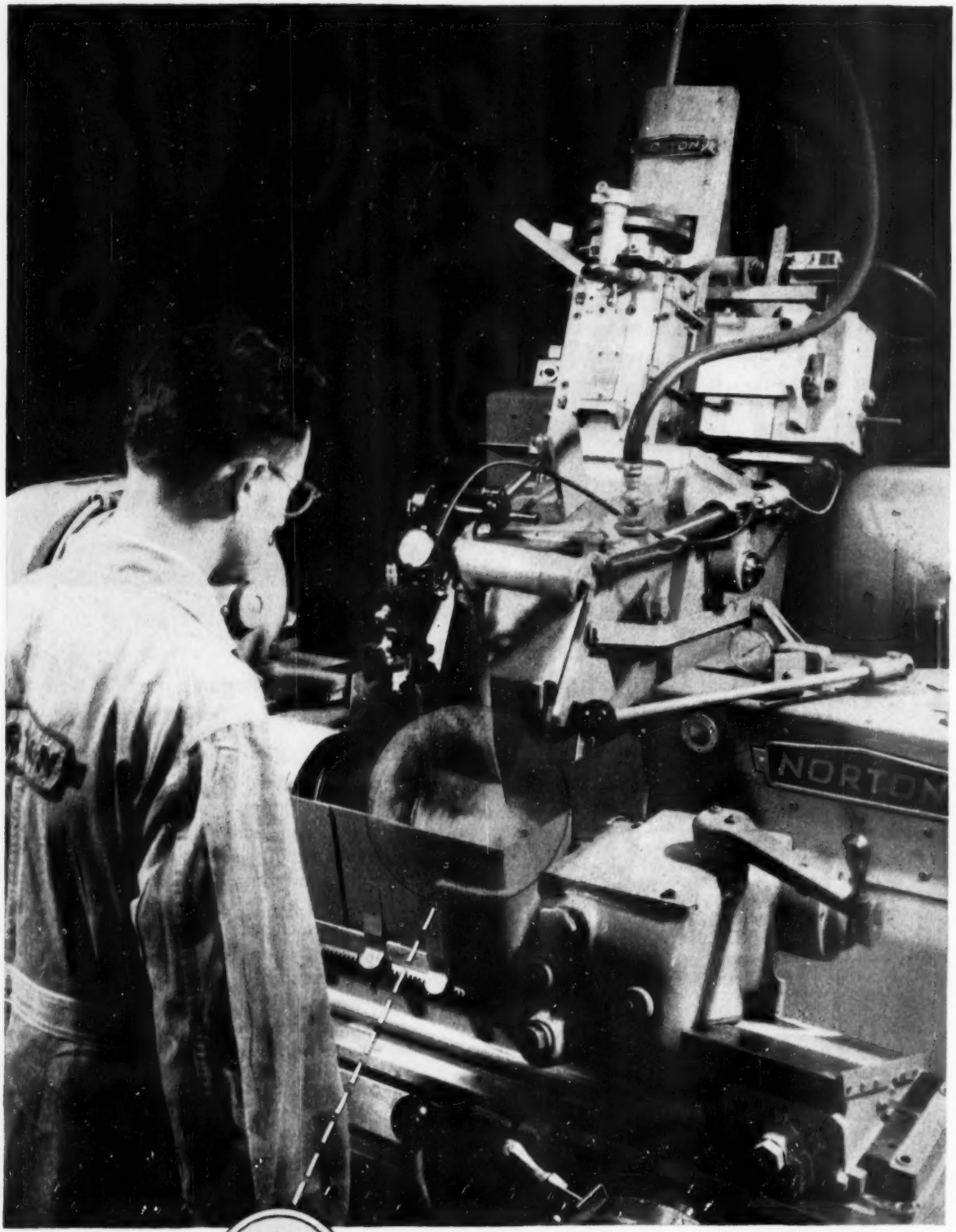
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

WANT to transmit power at high speeds . . . *with better than 98% efficiency for the life of the drive?* With Link-Belt Silverstreak Silent Chain you get lower initial cost on many applications . . . lower operating costs in all cases. In addition, ability to operate at higher speeds means less investment in motors and controls. Efficient operation on extremely short centers saves space, too. Remember, you can get positive, no-slip Link-Belt Silent Chain Drives from fractional to thousands of hp, with drives from ½ to 50 hp available from stock. Ratios range from 1:1 to 7:1. Contact your nearby Link-Belt office or distributor today.

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia).
Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13.241



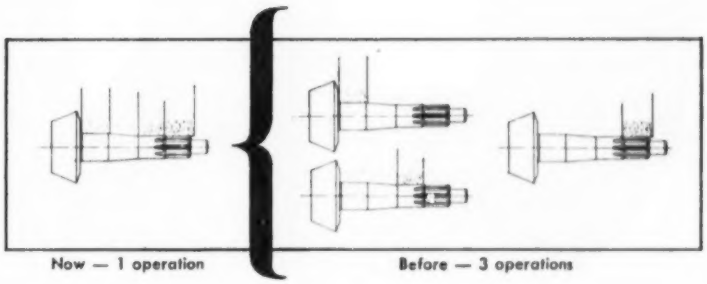
Up 128%

A big step forward in grinding operations, this Norton 10" Type CTU Semiautomatic Grinding Machine includes many advanced features. For example, the multi-wheel mount and automatic wheel guard type truing device help add the production-boosting, cost-cutting "Touch of Gold."

Now!...production increased 128% with this 3-way

"TOUCH OF GOLD"

A single Norton 10" CTU Semiautomatic replaces 3 separate grinders . . . cuts time, labor, costs



Here's an actual grinding job that shows clearly how advanced grinding techniques can reduce capital investment and step up production to new, profit-boosting highs.

THE PROBLEM. In producing an automotive part, a manufacturer was performing three separate grinding operations. Seeking to better his rate of 35 complete parts per hour per machine, he put his problem up to Norton engineers. They recommended replacing his three old-type machines with a single Norton 10" Type CTU Semiautomatic Grinder with multi-wheel mount and automatic truing device.

THE PAYOFF. Results were real eye-openers. The new Norton Grinder accurately performs all three operations at once . . . and produces 80 parts per hour for a rate increase of 128%!

Many examples of the "Touch of Gold"

That's just one of many instances of how Norton grinders and lappers assure the "Touch of Gold" that means sure savings in time, labor and money. There are many others. For example, another 10" Type CTU upped production from 300 to 600 parts per hour, replacing two old-type machines. And a 6" Type CTU more than doubled production of a part that previously required two separate grinding operations.

Why not add these advantages to your own production? Remember: only Norton offers you such long experience in both grinding wheels and machines to bring you the "Touch of Gold" — to help you produce more at lower cost.

For complete information, see your Norton Representative or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

***To Economize, Modernize With* NEW**

NORTON

GRINDERS *and* LAPPERS

Making better products . . . to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

Only CARBORUNDUM gives YOU

CARBO

TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York

so wide a choice of abrasive tools

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

Take off-hand grinding, for instance. You can count at least 7 different abrasive methods of off-hand grinding. How can you be *sure* the method you are using is the best —the lowest in cost? By asking CARBORUNDUM . . . for CARBORUNDUM alone has a complete, branded line of grinding wheels *and* abrasive belts *and* tumbling and polishing grains. Only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

Or suppose you manufacture fountain pens. You can finish and polish the barrels with abrasive belts or grinding wheels . . . you slit the points with a tiny grinding wheel . . . finish the clips with tumbling abrasives. CARBORUNDUM alone gives you *one-source control* of abrasive quality, on every type of abrasive you use . . . quality that's constant, identical, dependable—thus economical.

Several ways to do one operation? Call in CARBORUNDUM. Several processes on one part? Call in CARBORUNDUM. Either way, you win.

Call your CARBORUNDUM *Salesman or Distributor* today!

He's your best bet for complete stocks, prompt delivery . . . and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today—it's to your profit!

Ready now—your free copy of the new big COATED ABRASIVE SELECTOR catalog . . . containing detailed recommendations for both machine and hand sanding operations on tough and soft metals, glass, plastic, wood. Phone for it today.

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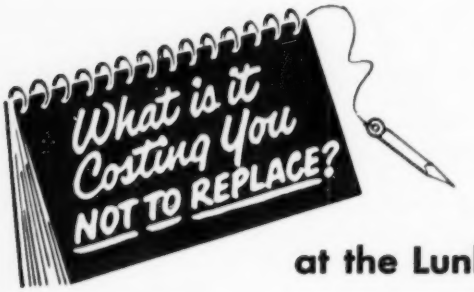
MARK

. . . the ONLY source for EVERY abrasive product you need

80-54

Leading valve manufacturer gets

49% TIME SAVINGS



Take a look at the tremendous time savings delivered by Warner & Swasey Turret Lathes at the Lunkenheimer Company, Cincinnati, Ohio

Warner & Swasey TURRET LATHE	OPERATION	TIME SAVED
No. 2 or 3 Universal	Cut and Burr Yoke Bushings	66%
	Cut and Burr Gage Valve Yoke Bushing	74%
No. 3 Universal	Turn, Face and Chase body end of Seat Rings	41%
No. 4 Universal	Cut Yoke Bushings end of Valve Body	48%
	Cut and Tap for Seat Ring, Turn and Face Yoke Flange	43%
No. 5 Universal	Cut and Face for Bottom Plug of Valve Body	55%
	Finish both Welding Ends of Valve Body	40%
2-A Heavy Duty	Turn, Bore, and Face Gate Valve Seat Ring	42%
	Bore, Finish Tongue and Cut off Disc Rings	34%
3-A Heavy Duty	Bore and Face Handwheels	65%
4-A Heavy Duty	Cut and Tap stem end of Gate Valve Disc	31%
AVERAGE TIME SAVED		**49%**

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

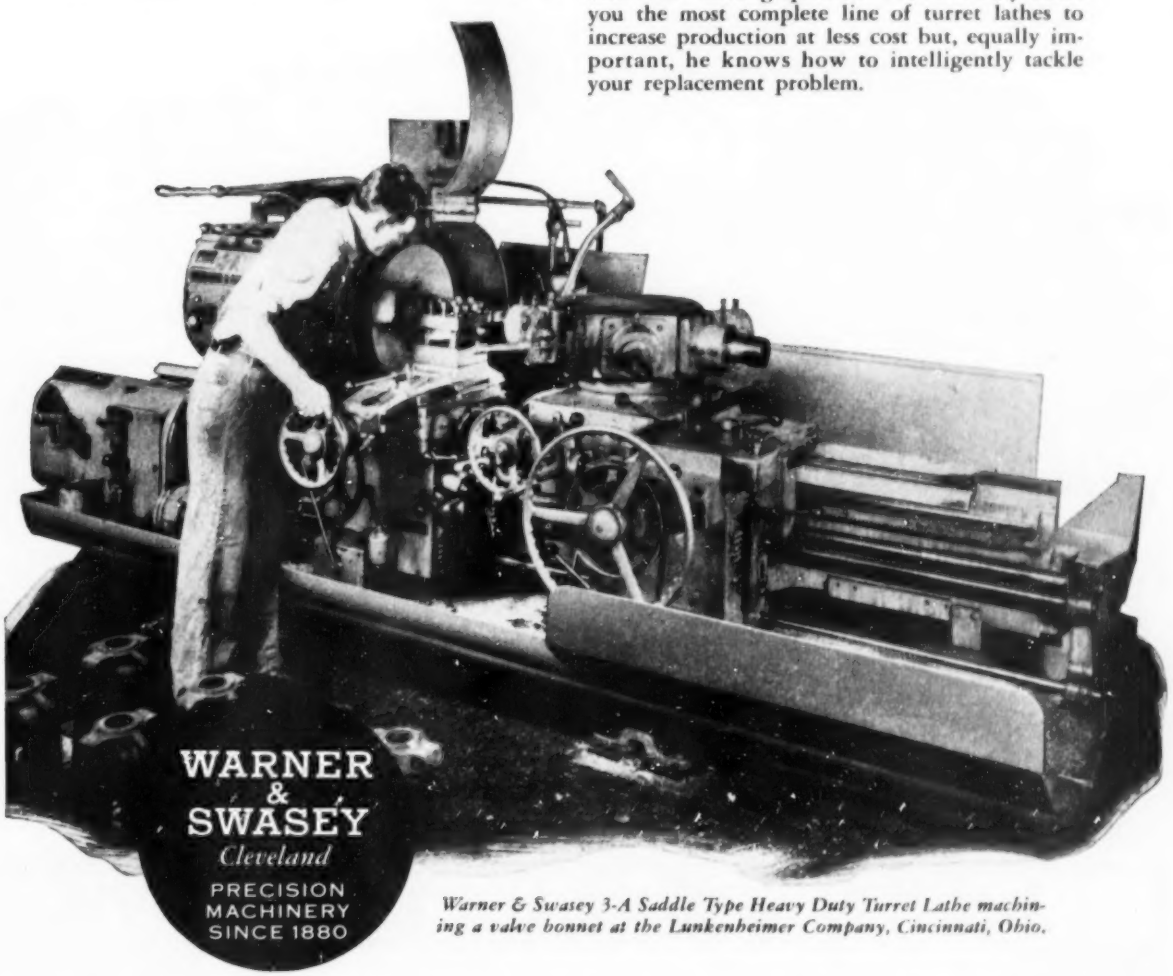
BY MODERNIZATION

ONE IMPORTANT PHASE of the Lunkenheimer Company's multi-million dollar modernization program was eliminating those costs which always continue to mount when equipment is not replaced at the right time.

So Lunkenheimer called in Warner & Swasey Field Engineers to study their turret lathe situation. These men (who actually function as "turning specialists") don't believe in recommending a machine or writing an order until their detailed analysis of specific requirements reveals just which type and size will cut costs to the bone. They take pride in seeing new machines pay off fast, as they did at Lunkenheimer.

Time savings here ranged from 31% to 74%!

For machining advice you, too, can confidently regard your nearest Warner & Swasey Field Engineer as a "turning specialist". He not only offers you the most complete line of turret lathes to increase production at less cost but, equally important, he knows how to intelligently tackle your replacement problem.



Warner & Swasey 3-A Saddle Type Heavy Duty Turret Lathe machining a valve bonnet at the Lunkenheimer Company, Cincinnati, Ohio.

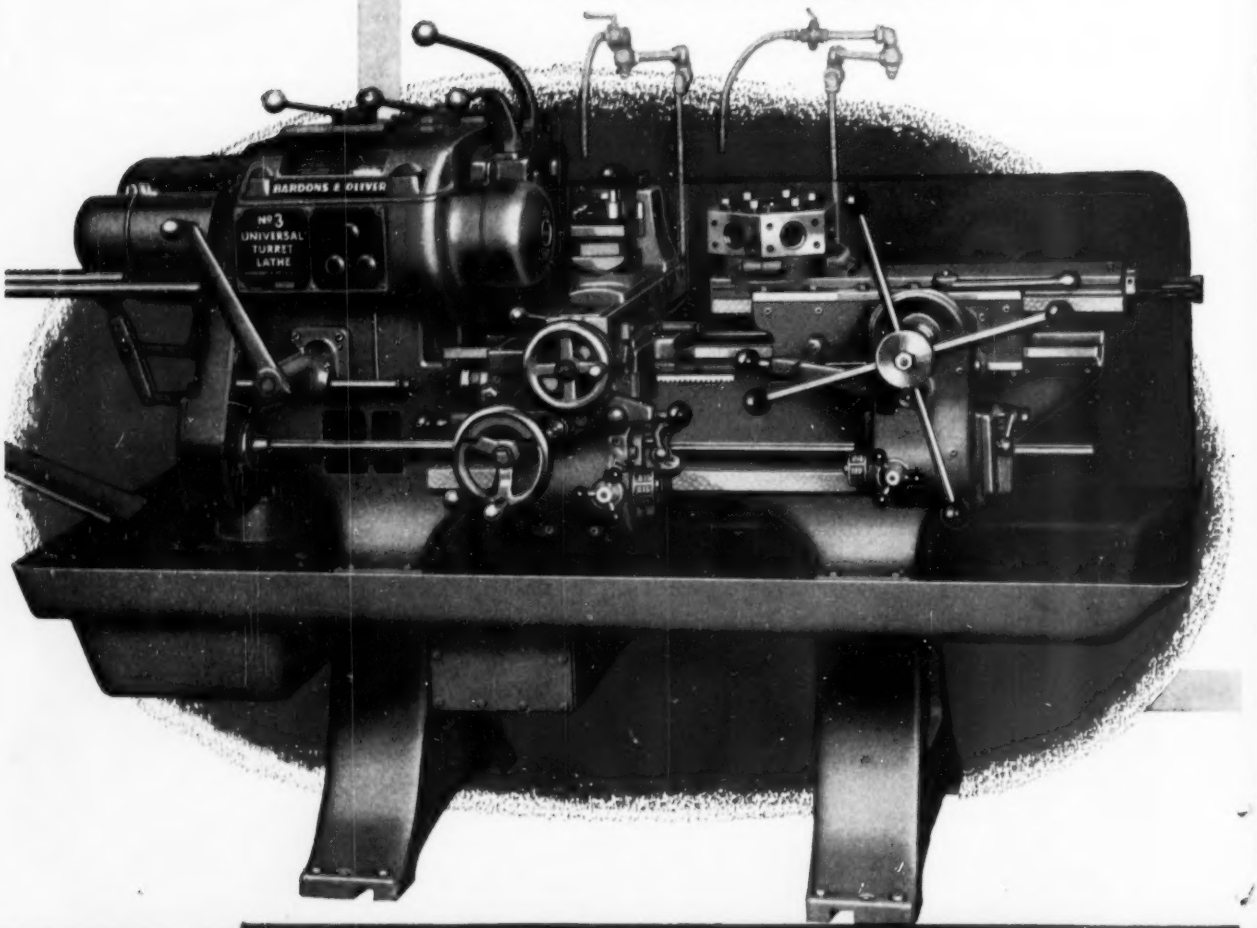
SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

New... BARDONS & OLIVER No. 3 TURRET LATHE...

★ 25% higher speed

★ 50% more power

★ 100% increased rigidity



BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

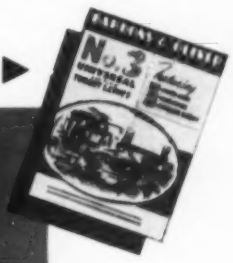
Featuring!

- √ 1825 R. P. M. Spindle Speed
- √ Unequaled Rigidity of "X" Type Cross Ribbing over Full Length of Bed
- √ 100% Anti-Friction Bearing Headstock
- √ Single Lever Feed Selectors for both the Hex Turret and Universal Carriage
- √ Alloy Bronze Anti-Backlash Nut on Cross Slide Screw
- √ "One-Shot" Lubrication of all Tool Slide Ways
- √ Flange Type Motor Mounting that Eliminates all Belts and Pulleys
- √ Hardened and Ground Steel Turret Slide and Saddle Ways, Gibs and Caps
- √ 7½ H. P. available at each one of 12 Geared Spindle Speeds
- √ Instantaneous High-Low Speed Change through Double Multi-Disc Clutch
- √ Replaceable Bed Ways of Solid Hardened and Ground Alloy Steel
- √ Large Hardened and Ground-in Thread Ball Bearing Cross Slide Screw
- √ Sealed Carriage and Saddle Aprons
- √ Improved Square Turret, Designed and Built for Lifetime Accuracy
- √ Impeller Type Coolant Pump with Individual Motor Drive
- √ Optional Collet Chuck Capacities (1½" or 2")

Specifications!

Swing Over Bed	15½ inches
Swing Over Guides	13¾ inches
Swing Over Cross Slide	7⅝ inches
Collet Chuck Capacity	1½ or 2 inch round
Hexagon Turret Travel	10 inches
Cross Slide Travel	9 inches
Carriage Longitudinal Travel	18½ inches
Turret and Carriage Power Feeds with Single Lever	6
Number of Speeds with Single Speed Motor	12
Motor Horse Power	7½
Net Weight With Cabinet Motor	3050 pounds
Net Weight With Flange Motor	2850 pounds

SEND FOR NEW NO. 3 CATALOG ▶



MANUFACTURERS OF A COMPLETE LINE OF
TURRET LATHES AND CUTTING OFF LATHES

Here's another reason it pays to get a proposal from Fosdick

We hold spindle runout to

Less than .0002" runout at the end of a 12" proving bar! That's one of *many* rigorous tests every Fosdick Jig Borer must pass before it leaves our shop. These tests are your assurance, and ours, that you will get true precision... as good as *or better than* any Jig Borer will deliver—regardless of price! This machine is available with Automatic Positioning which enables you to locate holes to ± .0001", quickly and without need for highly-skilled operators.

For full description of the Fosdick Jig Borer, ask for Bulletin JBA.

to give you

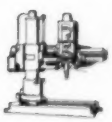
Precision Drill Head Boring Speeded by Automatic Positioning

Boring this four-piece 28-spindle drill head housing is a tough job in any man's shop. All bores have to be held to ± .0002". Further, all back boring on spindle locations must be within .0001" for alignment because any error multiplies 5 times or more at the drill point. For jobs like this, Fosdick's Proposal to the R. & B. Tool Co. of Saline, Mich., called for a 42-P Jig Borer with Automatic Positioning. In the first four weeks after R. & B. received the machine, they completed seven sets of the housing illustrated. Each included 139 holes charted, roughed and finish bored. Each, with a total of 528 machine positions, *required only 38 hours to complete.* Ten hours less, R. & B. estimates, than if they'd used a machine without automatic positioning!

.0002"

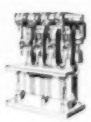
precision boring like this

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers



Sensitive and Upright Drills

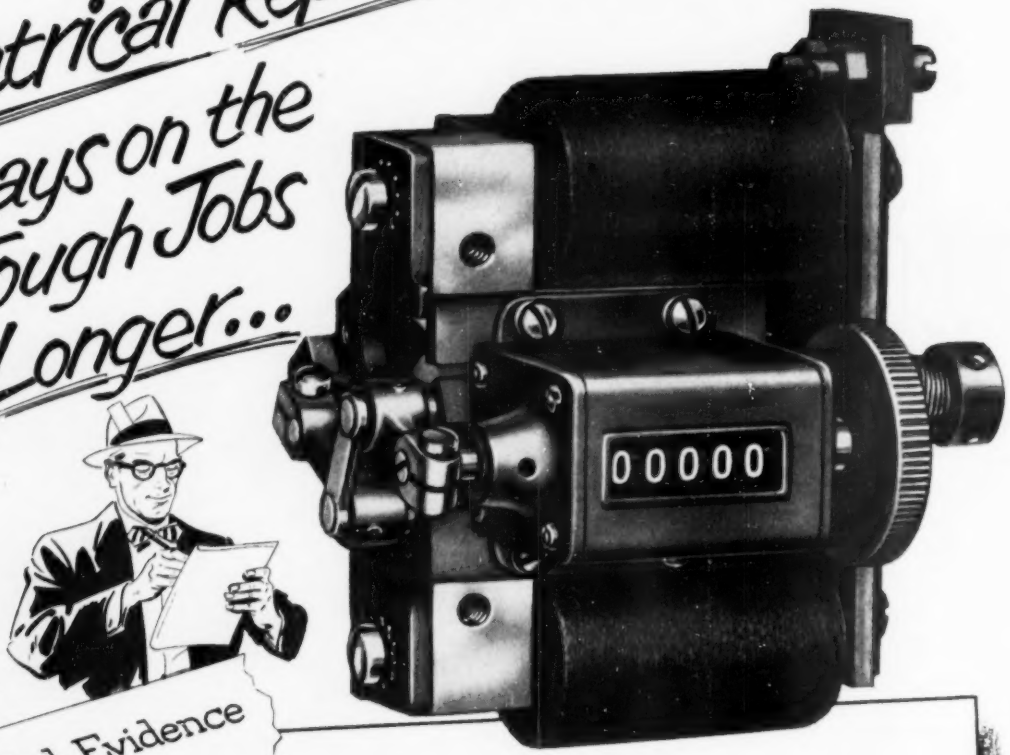
Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

This Electrical Reporter Stays on the Tough Jobs Longer...



Added Evidence that—

Everyone Can Count on VEEDER-ROOT

Compact and rugged . . . this electrically operated reset counter is specially designed for tough jobs that demand longer counter life.

Here's another instance of the *infinite applicability* of Veeder-Root *Count*rol — electrical, mechanical or manual. And here's another instance, too, of the endless resourcefulness of Veeder-Root engineering, and the ability to design a *complete counting package* that fits the job fully and exactly. Now . . . what's *your* problem?

VEEDER-ROOT INCORPORATED

"The Name That Counts"

HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N.Y. • Greenville, S.C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities

It MUST have been good!

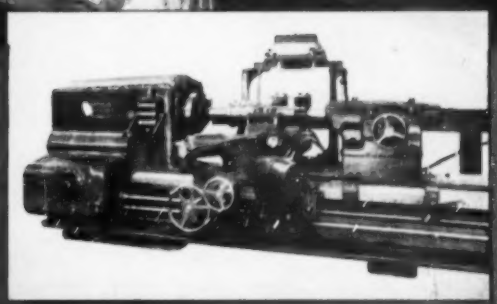
There are times when expressions speak louder than words.

Here's a group of distinguished steel mill roll executives watching a demonstration on a 26" Capacity "AMERICAN" Hydraulic Roll Lathe—judge for yourself whether or not they are satisfied with what they saw.

These machines are performing "miracles" in savings in many of the best known roll shops in the country. They have introduced a brand new machining technique that has revolutionized the art of roll turning. They reproduce work shapes from a template faithfully and accurately not only on steel mill roll bodies and necks, but on such work as spindles, motor shafts, valve stems, step shafts, piston rods, axles and a wide variety of chucking work having irregular contours.

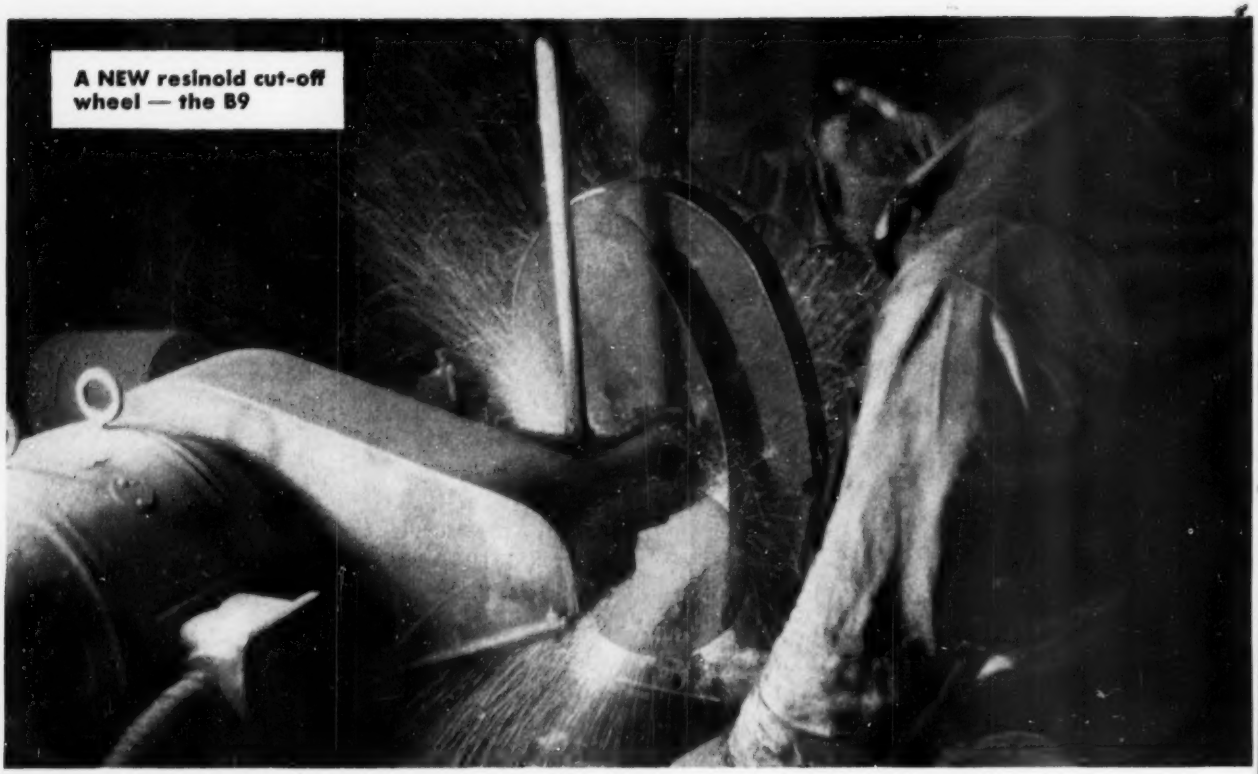
Evidence from hundreds of installations proves beyond a shadow of a doubt their leadership as top-flight cost reducers. Was there ever a time when cost reduction was more urgently needed?

If it's proof you want just drop us a line—no obligation.



THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS



The new B9 is as fast-cutting as they make 'em. Adaptable to speeds up to 16,000 surface feet per minute, the new Norton B9 cut-off wheel is a real production booster. Resinoid bonded and available with either smooth sides, or with the rougher "F" sides for greater chip clearance, it's a cool-cutting, non-burning performer on all types of metals.

Add the "TOUCH of GOLD" to all your cut-off jobs

Your cutting-off jobs may involve ferrous or non-ferrous metals of any degree of hardness — or non-metals ranging from rubber hose to marble. Your machines may be high speed or low speed — swing frame, chopper, traverse, floor stand or portable. The point to remember is:

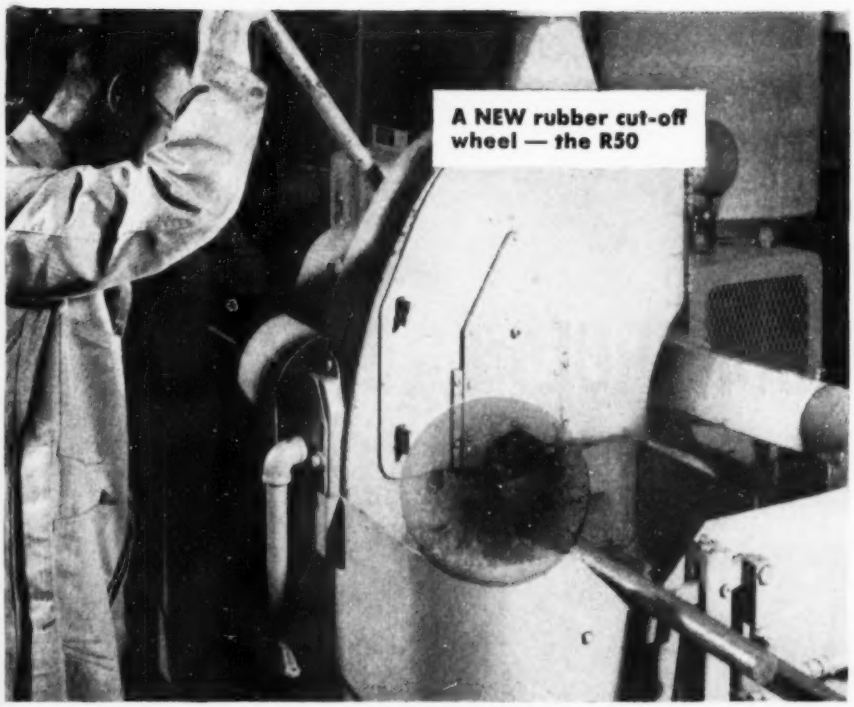
With the right Norton cut-off wheel you're sure of the fast, safe, clean-cutting performance that adds the profit-boosting "Touch of Gold" to every job.

Norton cut-off wheels are made with resinoid, rubber and shellac bonds, in ALUNDUM* (aluminum oxide) abrasive and CRYSTOLON* (silicon carbide) abrasive, and in a complete range of sizes. Whatever its type, you can count on every Norton cut-off wheel for the easy handling and exceptional breakage-resistance that mean happier operators and higher production.

Your Norton distributor will be glad to recommend the *right* cut-off wheels for your jobs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

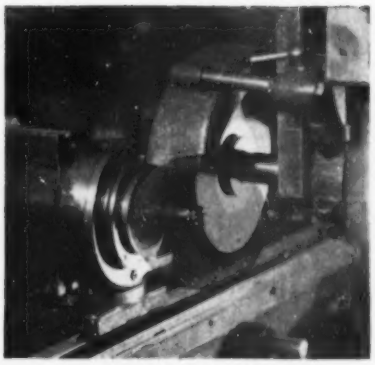
NORTON
ABRASIVES
Making better products... to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

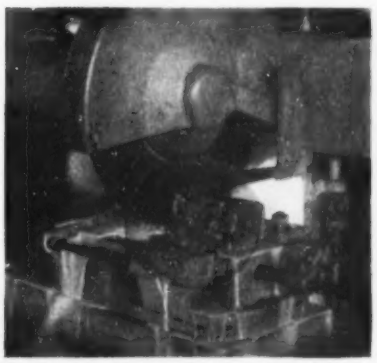


The new R50 has built-in chip clearance. Designed primarily for wet-cutting of metal bar stock, this new Norton rubber bonded cut-off wheel handles diameters up to 2½" on chopper machines and up to 6" on oscillating machines. Built-in chip clearance, unusual in this type of wheel, is one of the reasons why the R50 cuts freer and cooler, without case hardening the ends of the stock.

The BN covers a wide job-range. You can't beat the long popular Norton BN wheel for general, all-around usefulness. Or for safety either, because the strong reinforcement of this resinoid bonded wheel practically eliminates breakage from the cutting-off picture. Uses include: notching, slotting and cutting-off gates and risers from non-ferrous castings; cutting wire rope; slotting railway track welds; tuck pointing; cutting non-metallic materials such as fibre board, concrete, tile, plastics, and the like.



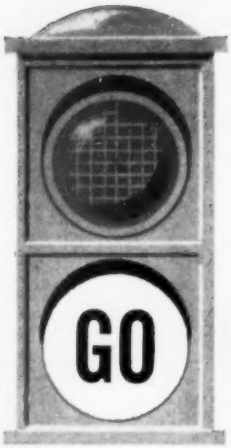
The B2 is versatile. Handy as a general purpose cut-off wheel for the tool room, the Norton resinoid bonded B2 is also used for lighter jobs on plastics, marble, carbon, brake lining and other non-metals.



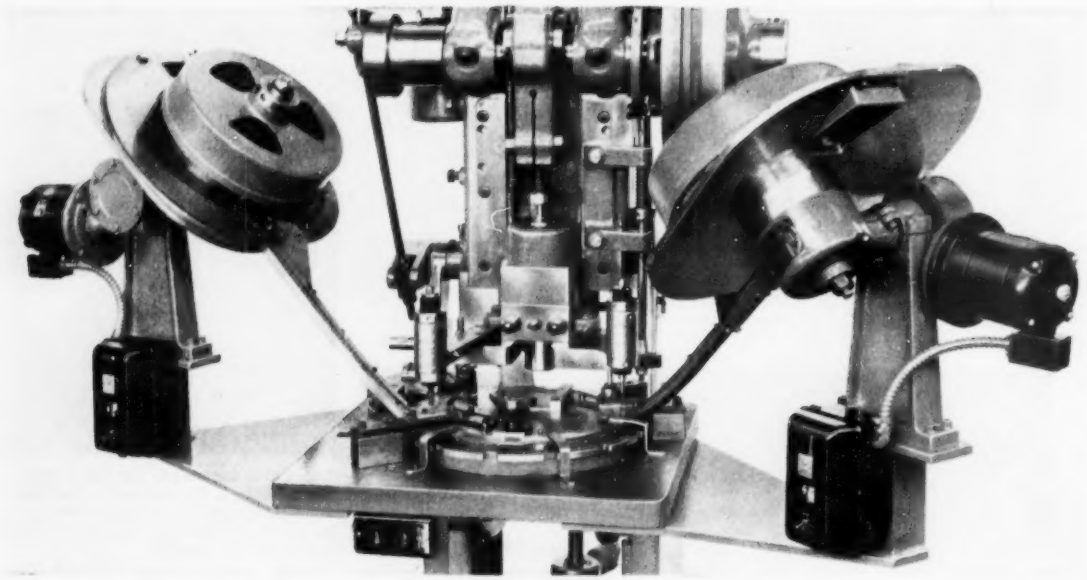
The R30 is standard. The bond used in the Norton R30 is the standard rubber bond for smaller wheels and is preferred for jobs such as cutting-off thin tubing, small diameter work and fine slotting.

The R20 is rugged. A very durable wheel, the Norton R20 has the strongest of rubber bonds. An ideal wheel for dry-cutting of metal rods and other jobs where dressing action is particularly severe.

When you run V & O long slide presses you can inspect an occasional few of your stampings and be sure that the others are exactly like them. And when you can do that, when your machines operate with such consistent precision that random or chance imprecisions are statistically unlikely, then you have quality control.



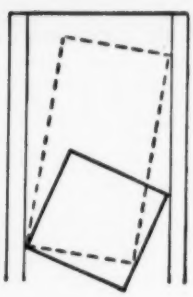
FOR QUALITY CONTROL GO V&O



V & O long slide press that automatically feeds and assembles two parts from their individual hoppers, 128 strokes a minute.

INVITATION TO INGENUITY

V & O long slide design provides space for precision-promoting tooling. Ingenious design can apply moving and stationary members that make random operating imprecisions statistically unlikely.



THE LONG SLIDE PRINCIPLE

eliminates the random imprecisions that can come from stroke misalignments.

The longer the slide the less can be the angular misalignment.

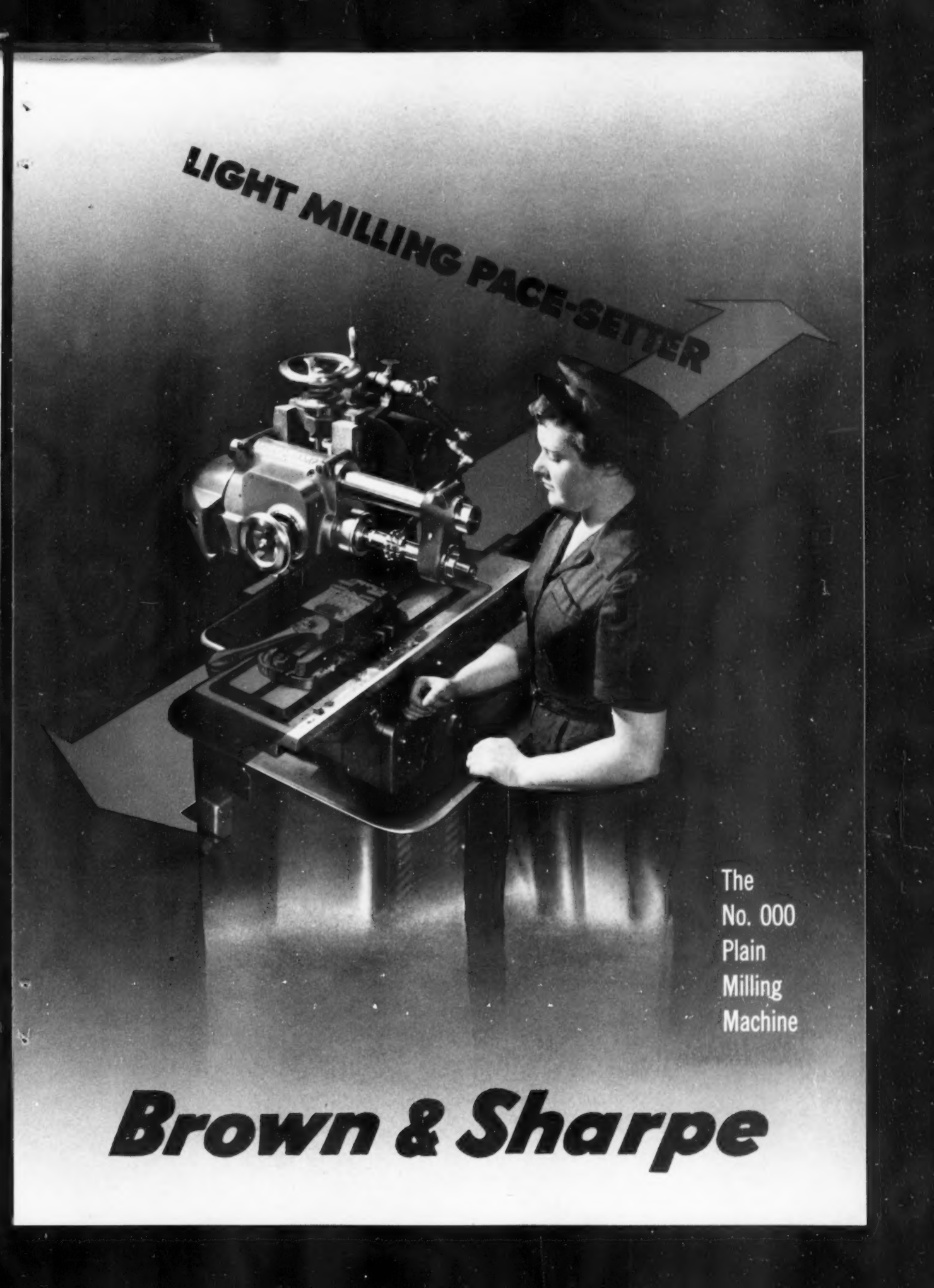
THE V & O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

HUDSON NEW YORK

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

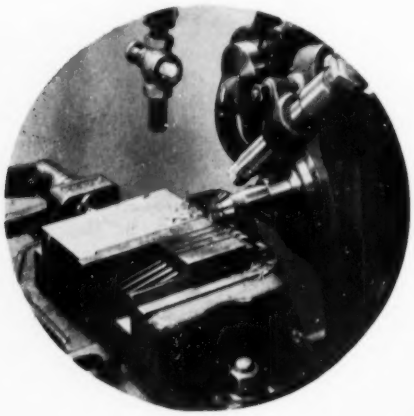
Only the best is good enough


LIGHT MILLING PACE-SETTER
The
No. 000
Plain
Milling
Machine
Brown & Sharpe

Makes Light Work of all Light Milling Jobs . . .

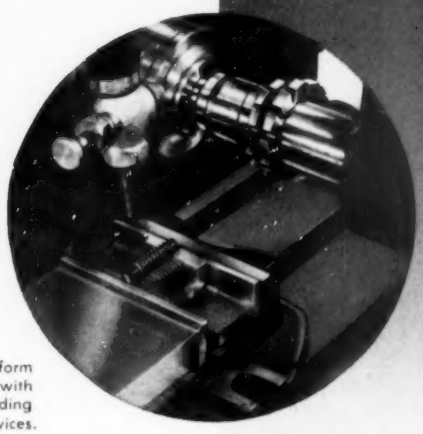
The No. 000 Plain Milling Machine is specifically designed for fast, effortless milling of small parts. Its extremely rapid automatic cycles pace the operator for uniformly high production rate with minimum fatigue. Moreover, its uniform cutting feeds extend cutter life, assure greater accuracy of work, and permit positive duplication of surface finish on every part. In nearly every plant there are many jobs to keep the No. 000 busy, continuously . . . milling small parts for business machines, firearms, appliances, timers, and similar products. Its important design advantages are illustrated.

Automatically duplicates blind cuts to accuracy within .002".

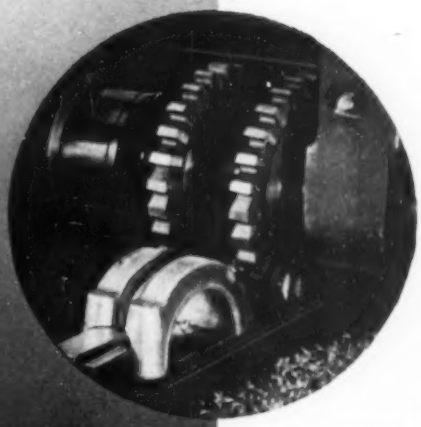


Takes short cuts practically as fast as operator can load fixture.

Brown & Sharpe



Rapidly handles light form milling jobs with inexpensive holding devices.

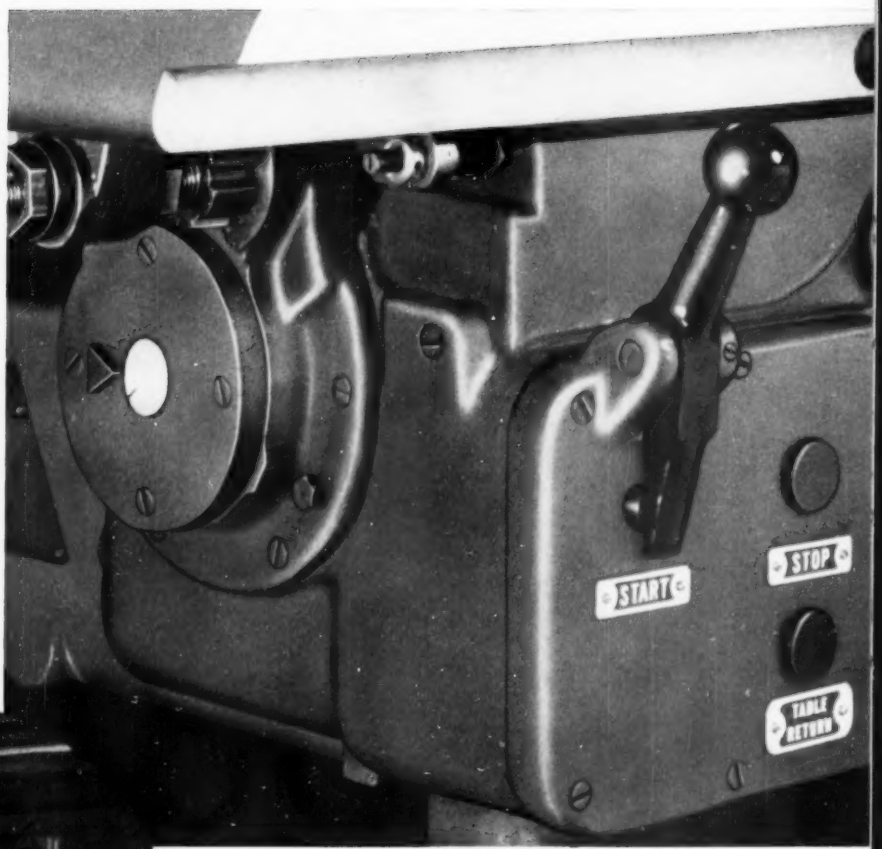


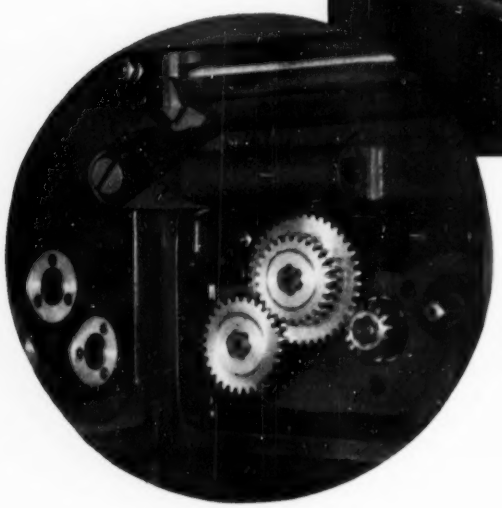
Uses comparatively large cutters or the smallest end mills . . . even permits climb milling.

Special fixtures, like this one, speed up output even more.

Complete Milling Cycle Controlled by ONE Lever

You just pull the starting lever on the No. 000 Plain Milling Machine and the table moves forward at 365" per minute; cutting feed automatically engages just before work meets cutter. After cut is completed, table automatically returns at same fast travel. Table reversal is accurate to within .002" . . . advantageous for blind milling operations.





Easy to Set Up for Highest Efficiency

Simple "pick-off" gears provide 16 automatic cutting feeds from 1/16" to 24 3/16" per minute. The single table dog is quickly adjusted to minimize non-cutting time . . . engages cutting feed just before work meets cutter. 16 spindle speeds from 105 to 2340 rpm (161 to 3540 rpm optional) are quickly available for efficient milling on many different materials from tough alloy steel to free-cutting materials like aluminum. Write for detailed Bulletin describing the No. 000 Plain Milling Machine.

Brown & Sharpe B·S

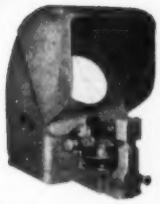
Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A. Printed in U.S.A.

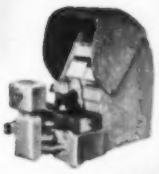
11 MODELS

3 SCREEN SIZES

Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models



Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

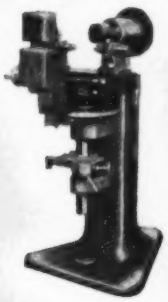
JONES & LAMSON OPTICAL COMPARATORS

The Essence of Quality Control

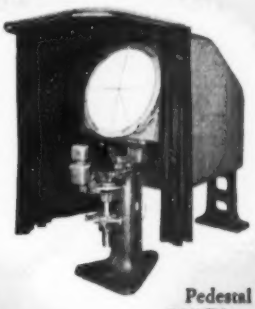
Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.

Vertical Type
14" Diam. Screen



Direct
Projection
Type



Pedestal Type
30" Diam. Screen

Jones & Lamson Machine Company
502 Clinton Street, Dept. 710
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

JONES & LAMSON *Machine Tool Craftsmen Since 1835*

JONES & LAMSON MACHINE COMPANY
502 Clinton St., Springfield, Vt., U.S.A.

COMPARATOR DIV.
Dept. 710

Genuine NATIONAL ACME Collets and Pushers for ACME-GRIDLEY AUTOMATICS

are *made only by* and are *available only from* NATIONAL ACME

IF YOU CONCENTRATED FOR 50 YEARS on the improvement of most any single purpose product, you would have achieved top acceptance or you would be out of business. It's the same for Acme-Gridley Collets, Pushers and other stock feed components.

The perfect collet has never been built—in any brand. But from our continuous study of all designs in hundreds of plants under all Acme-Gridley operating conditions, we know that these "National Acme" branded components have achieved the near-perfect in the primary essentials of—

- **positive gripping power**
- **precision grinding and gauging**
- **uniformity of heat treatment**
- **ease of adjustment in use**

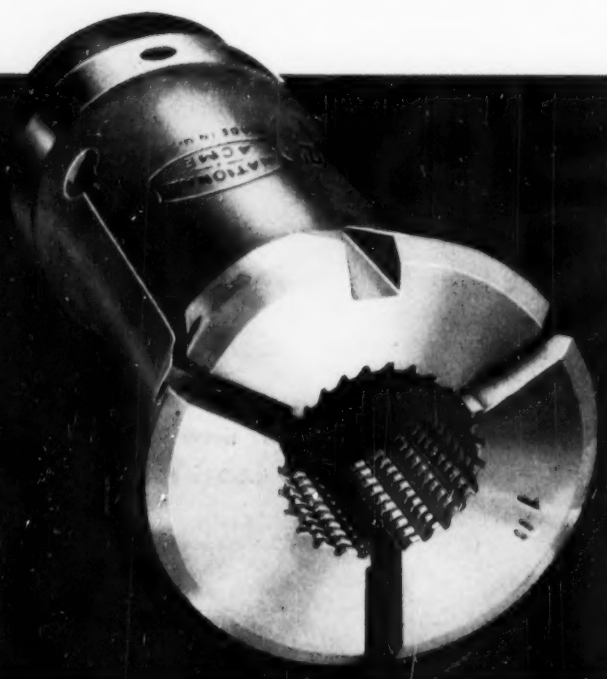
These are the practical results through which most owners of 45,000 Acme-Gridley Automatics prove for themselves superior performance and low over-all cost. (Prompt deliveries to suit your particular requirements.)

The NATIONAL ACME Company

170 East 131 St. • Cleveland 8, Ohio.

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

Write for complete details in Catalog CP-49A.



Master Collet and Pads

Solid Pusher

Master Pusher and Pads

Nowhere can you get so much for your Collet and Pusher dollar as at the source of your machines to which they are engineered.

SOME ANSWERS TO YOUR SHOP QUESTIONS ON

deep drawing

STRAIGHT-CHROMIUM STAINLESS STEELS

Single draw forms this sink from Type 430 Stainless Steel

This kitchen sink fabricated by a prominent manufacturer, is a striking example of the deep drawing properties of U·S·S 17 (Type 430) Stainless Steel.

It was formed from a 30" x 32" blank of 20-gage Type 430 Stainless Steel *in a single draw* without post-annealing.

This sink was formerly fabricated from a grade of nickel-bearing Stainless Steel. But restriction on the use of this grade turned attention to readily-available straight-chromium Stainless. It was found that this product could be fabricated from U·S·S 17 Stainless without changing the design.

This is another in a series of advertisements discussing the straight-chromium grades of Stainless Steel from the standpoint of fabricating performance. Other operations that will be considered in future discussions are machining, cutting, spinning, welding and finishing.

DEEP drawing of such straight-chromium grades of Stainless Steel as U·S·S 17 (Type 430) is being carried out successfully by a growing list of fabricators. Their experience indicates you need expect no difficulty if a few simple principles are kept in mind.

Straight-chromium grades have a lower ductility and a higher yield strength than the nickel-bearing grades. In fact, their drawing characteristics are more like that of carbon steel.

As a result, die clearances and hold-down pressures should favor feeding in of the metal rather than stretching. Stock to be worked should be at least room temperature and it may be helpful to warm the blanks in boiling water. Well-lubricated dies should be used at all times.

In the first draw, reduction should be held to 20 to 25% with 35% as the maximum in special cases. Subsequent draws should not exceed 15%. Annealing between draws may or may not be necessary.

In connection with annealing, it should be remembered straight-chromium grades anneal at much lower temperatures than nickel-bearing grades of Stainless Steel. Consequently, there will be only slight scaling and no difficulty in removing it.

In every case, it will pay you to consult with our representatives concerning straight-chromium Stainless Steels. They will examine the job from the standpoints of end use and shop equipment and give you their recommendations.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S STAINLESS STEEL

USS

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

3-494

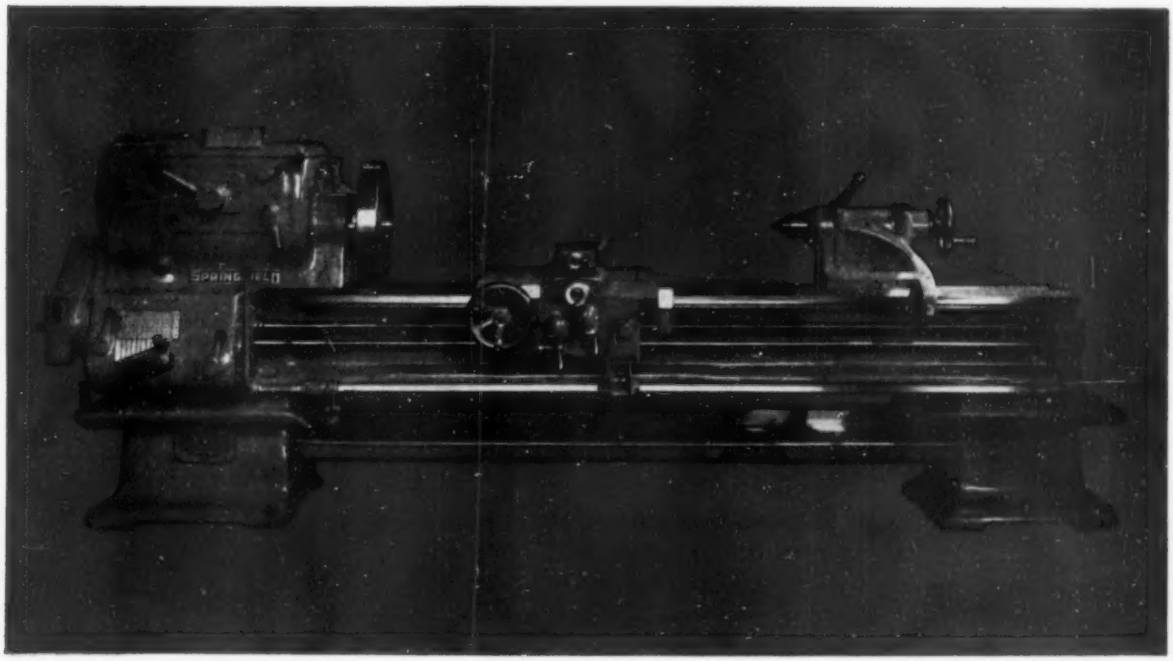
UNITED STATES STEEL

SPRINGFIELD

At TRACTOMOTIVE Corporation

Tractomotive Corporation, Deerfield, Illinois, manufacturers of the widely known line of TRACTOSHOVELS and TRACTOLOADERS use several Springfield Lathes on heavy operations. Tractomotive's management says: "Production records, low maintenance costs and operator preference have shown us that Springfield Lathes fit our manufacturing picture perfectly."

LATHES



What are YOUR Lathe Production Problems?

TURNING—BORING—CONTOURING—PROFILING?

Springfield has a long record of successful pioneering in the adaptation of Springfield Lathes to production of all types of work. Extreme versatility is a characteristic of Springfield Lathes and Accessories. Your production can be improved by installing a Springfield Lathe equipped with proper attachments.

Information is available to you through an experienced Springfield Distributor in your area. We will gladly arrange for a sales engineer to survey your production problems.

Write, wire or phone:

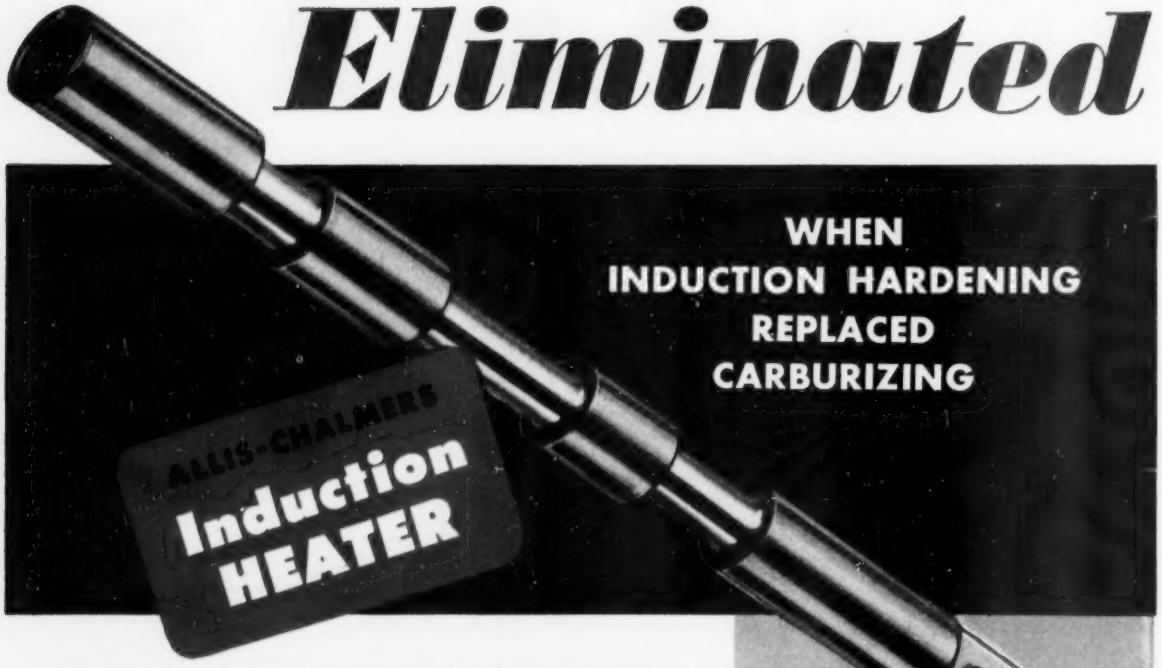
THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 640 W. WASHINGTON BLVD., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

Rejects Eliminated



WHEN INDUCTION HARDENING REPLACED CARBURIZING

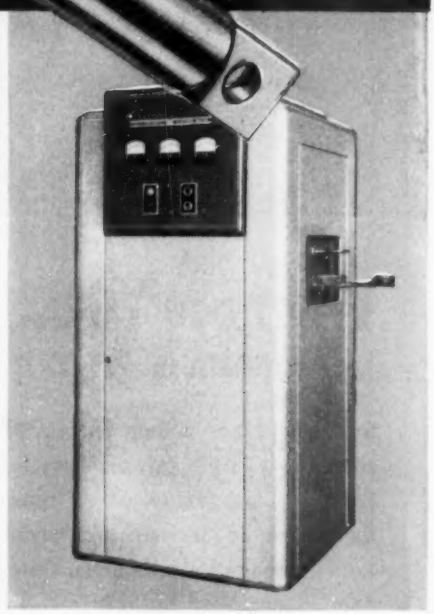
A LEADING AIRCRAFT BUILDER had a high reject rate while carburizing hydraulic control valves. In addition, production was slow. Rework after rework was necessary because material was brittle and straightening was difficult, if not impossible. Depth of carburization was also hard to control . . . and it was a dirty job, too!

Picture Changed Overnight

Now, with Allis-Chalmers induction heaters rejects or reworks are eliminated; depth of hardening is held between .078 inches and .080 inches; production is greatly increased; and it's a clean, pushbutton type job.

Where there's a problem with warpage, scaling, or heat control, even a relatively low production item can often be profitably processed using induction heat.

Bring your problems to Allis-Chalmers. Call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4169



ALLIS-CHALMERS

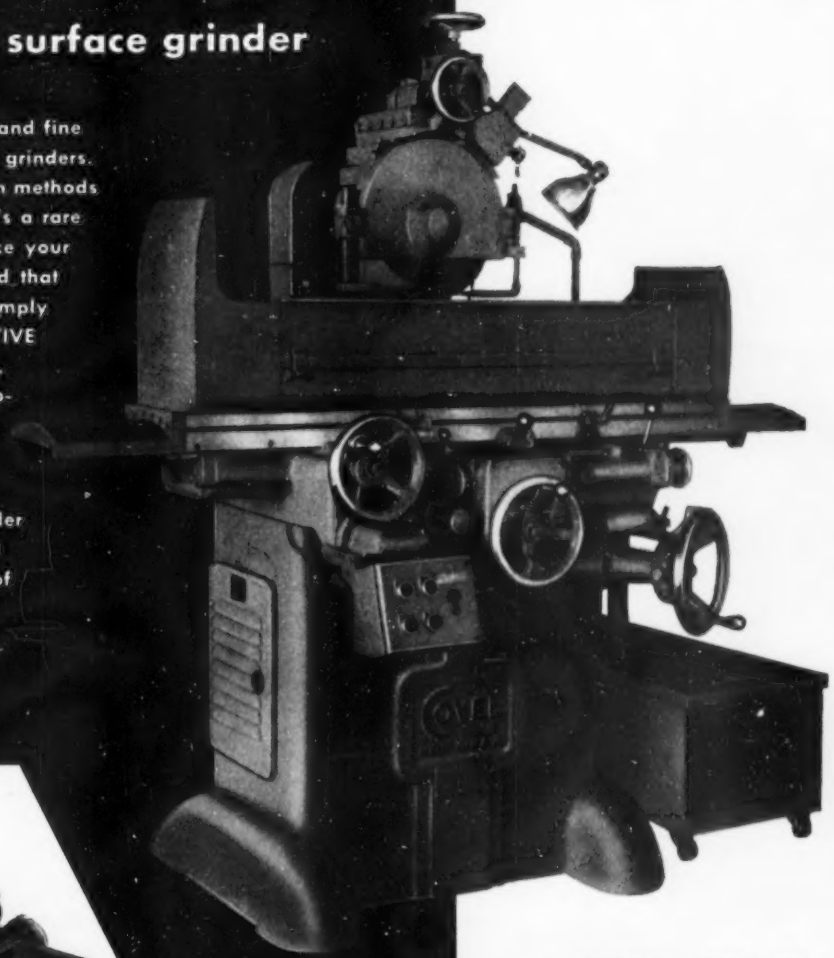
See Allis-Chalmers Induction Heater in Operation at the National Metal Exposition and Congress, Oct. 19-23, Booth 2621, Cleveland, Ohio

WHAT COVEL'S 80 YEARS CAN MEAN TO *you*

when you select a surface grinder

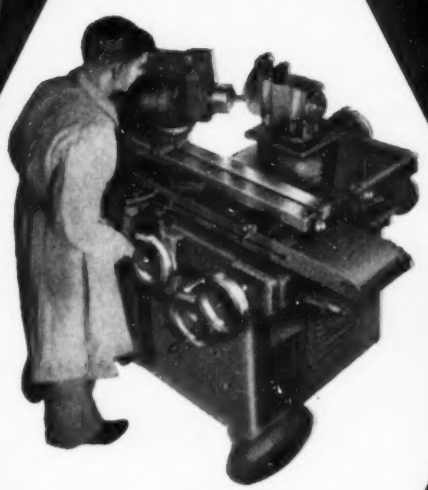
It takes more than special features and fine materials to build the best surface grinders. Skilled workmanship, yes . . . modern methods and equipment, certainly. But there's a rare quality—a plus value that can make your grinder investment extra sound and that quality is yours with Covel . . . It's simply this: EIGHTY YEARS OF CUMULATIVE EXPERIENCE—of constant progress, keeping pace through four war production periods and through many business peaks and valleys.

So, when you select a Surface Grinder —or a Cutter and Tool Grinder, call on Covel and draw on this wealth of practical, productive experience. Send for data.



SURFACE GRINDERS
HYDRAULIC FEED:
14"x24"; 8"x24"; 6"x18"
HAND FEED: 6" x 18"

Send for Bulletin A1-113



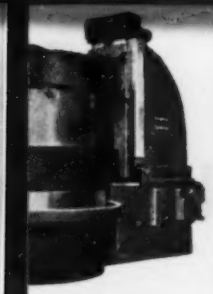
UNIVERSAL
CUTTER and TOOL GRINDERS
10"x30"; 10"x24"; 8"x16"

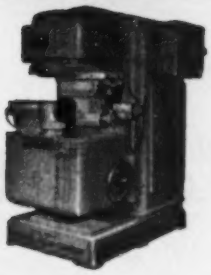
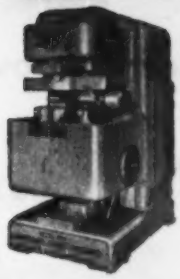
COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

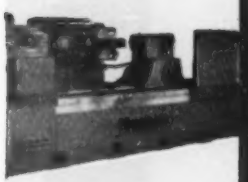
Hobbing
Transmission Gears
350% Faster
1458 Ultra Speed Gear Hobber
GEAR CUTTING
GEAR FINISHING
GEAR LAPPING
GEAR CHECKING



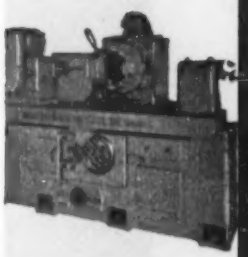



.....headline in Production Engineering & Management January, 1953

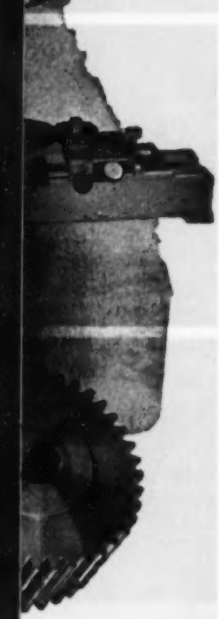
"FORD Hobs Gears 350% Faster"



We've checked on it and the editors of PRODUCTION ENGINEERING & MANAGEMENT are right. At Ford Motor Company 3⅛" diameter, 9-pitch, 1⅛" face width transmission gears are being hobbed at a production rate 350% greater per spindle than compared with multiple spindle machines. To do this Ford uses one of the new Michigan Ultra-Speed gear hobbers equipped with double thread accurate unground Michigan hobs. Gears are hobbed two at a time, 58 seconds per pair.



Despite the high output rate, 225 gears are produced per sharpening of the hob. Among the reasons given are that "the machine is of rugged, compact construction, simplified in design, with few gears for the index and main drive and . . . with a maximum spindle speed of 1000 rpm."



Of interest is that better control of surface finish is obtained by easier subsequent shaving. Loading and unloading time is kept to a minimum by hydraulically-actuated expanding arbors. Vibration has been practically eliminated by providing maximum rigidity plus a flywheel to dampen torsional vibration.

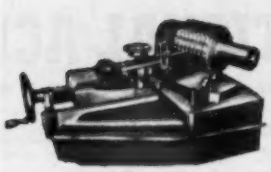
For further details, write for Bulletin #1458-52.

GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL Company

Complete from blank to finished gear equipment

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.



another reason why owners say—

"We use the VERS-O-TOOL SYSTEM"

They call it a "system" because, among other exclusive features, Vers-o-tools are provided with a patented Namco Micrometer that takes the guess-work out of chaser grinding.

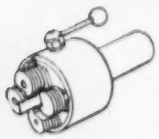
No trial cuts, no adjustments, no time or scrap loss. And by providing an extra set of chasers, kept ground in the toolroom and ready, you put long run jobs on a continuous production basis. Time saved by using this gage frequently adds thousands of precision threads—reduces your costs.

Other Advantages of the System

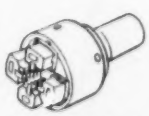
Standard Vers-o-tools use either the famous ground thread circular chasers or the lower cost, adjustable-blade, ground thread chasers—interchangeable die size for die size, in both revolving and non-revolving self-opening heads. The same system applies for end forming and end turning cutters. Use of knurls and rolls is common practice.

Once you start using Vers-o-tools, you are immediately equipped for a more versatile use of threading equipment, at a lower tool investment, than is possible from any other source.

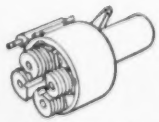
Ask for DT-52, complete new catalog on Vers-o-tool and Namco Solid and Collapsible Taps.



Style DS Vers-o-tool (Non-revolving Type) 10 Sizes, ⅜"—6½".



Style DR Vers-o-tool (Revolving Type) 13 Sizes ⅛"—6½" Shown with Adjustable Blade Chasers 7 Sizes, ⅜"—2".



Style DBS Vers-o-tool (for B&S Automatics) 3 Sizes, ¼"—⅝".

Patented NAMCO MICROMETER

takes the guess-work out of chaser grinding

THIS IS THE WAY IT WORKS:

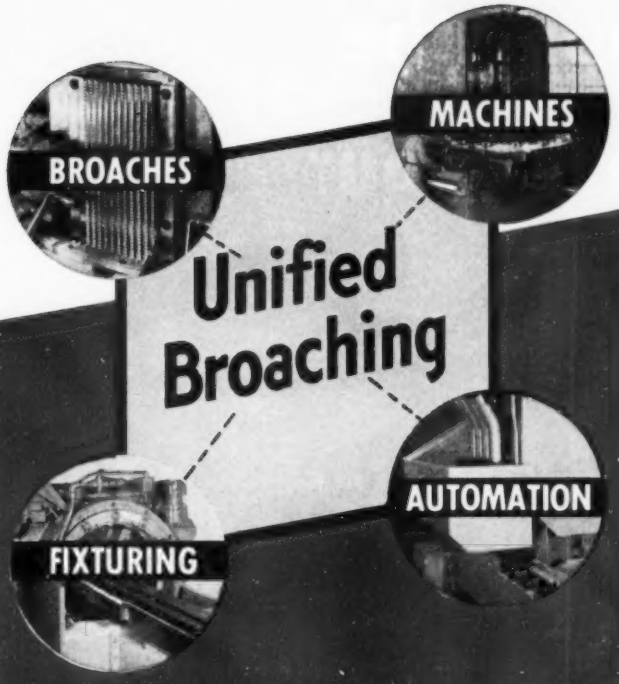
- ★ Remove chasers from Vers-o-tool head (in one minute) and take a micrometer reading.
- ★ Regrind them to the same micrometer reading. (Perfect control of the grind is automatic through serrated mounting of circular chasers—rechecking on the gage proves their uniformity.)
- ★ Replace chasers in head (one minute) with certainty that they will cut threads *identical* to those cut on previous grinds.

24-HOUR DELIVERIES ON MOST STANDARD STOCKABLE NC AND NF CHASERS AND BLOCKS — ALSO NATIONAL TAPER PIPE AND DRY SEAL

The NATIONAL ACME CO.

170 EAST 131 STREET, CLEVELAND 8, OHIO.

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8-Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing

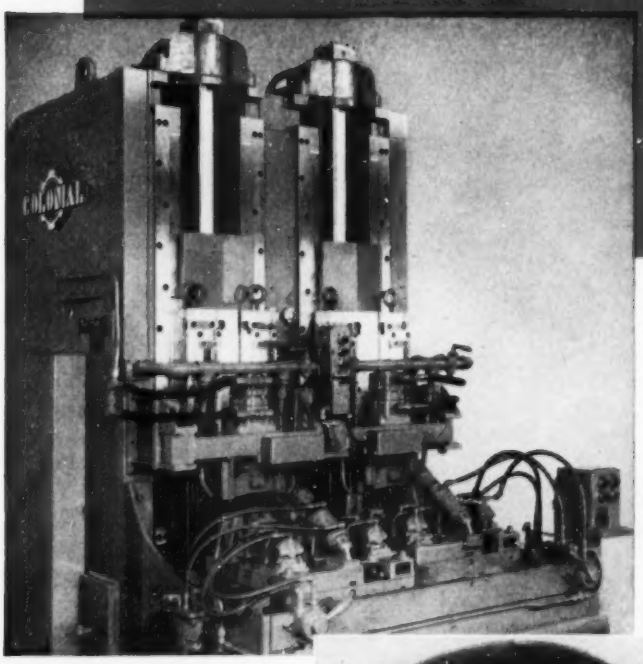


the COLONIAL method

At Colonial, experience, imagination and competence are applied

1 to the design and manufacture of each of the individual components of a complete broaching installation, and

2 to the effective combining of ALL components into a completely UNIFIED BROACHING installation—making them work as a "team."



400 Brake Shoes Broached per Hour

Here a 1/2-inch slot and a 13/32-inch concave are broached at opposite ends of 400 brake shoes per hour. Stock removed is 3/32-inch.

Colonial provided instantaneous pneumatic positioning; automatic hydraulic clamping; two shuttle fixtures; uniform taper insert broaches—all unified on a Colonial dual ram with 54-inch stroke.

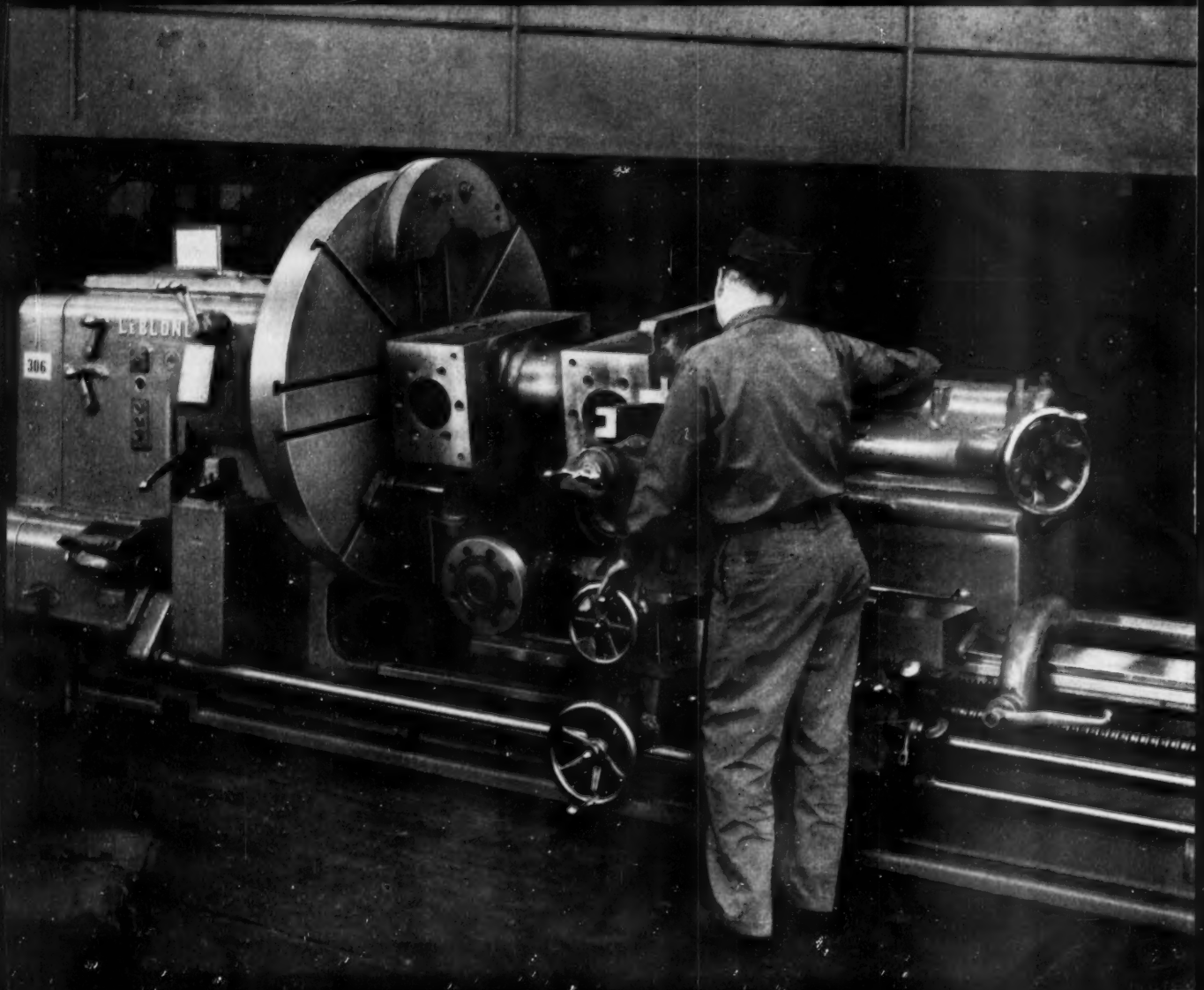
WHAT'S AHEAD IN BROACHING?

Keep up with the latest developments: Read "Broaching News". We will be glad to see you get it regularly if you will drop us a line on your company letterhead.

PIONEERS OF H.S.S. BROACHING

COLONIAL BROACH CO. DETROIT 13

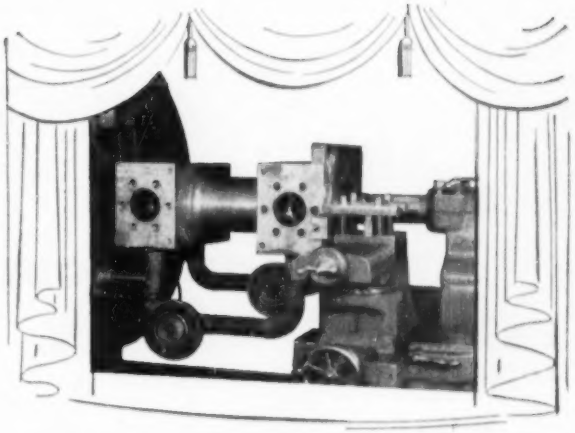
Le Blond Gap Lathe stars in 16-hour Variety



In operation shown, LeBlond 32"/60" Sliding Bed Gap Lathe is used to finish faces of compressor cylinder. Faces must be made parallel, square to bore. Extending manifolds require 78" swing. Job is supported on plug centers, weighs about 3 tons. Spindle speed, 76 rpm; feed, .010; 2 cuts; job time, approximately 110 minutes.

Show at Clark Brothers

Juggles Diameters From 6" to 78"
. . Satisfies Critics
with Stellar Performance!



Clark Brothers Company, Olean, New York, had to "book" a one-lathe act—a single machine to turn out a wide variety of components for "Big-Inch" Type compressors. A special lathe for occasional large-diameter work was too costly.

"Talent scouts" at LeBlond's Buffalo distributor, The Buffalo Machinery Co., recommended their hottest variety number—a LeBlond 32"/60" Sliding Bed Gap Lathe.

Now this versatile machine performs 16-hours-a-day at Clark Brothers, takes the place of at least two machines. One specialty is truing-up and finishing heat-distorted compressor cylinders with manifolds already welded in place—faces must be made parallel. The sliding bed of the LeBlond Gap lathe opens up readily to meet the *78" swing requirement.*

With gap closed, it operates as a standard heavy duty engine lathe, turns power cylinders and cylinder liners *ranging from 6" to 30" diameters, requiring tolerances of ± .0015".*

The multi-purpose LeBlond Sliding Bed Gap Lathe is a sweetheart in the shop. Has adjustable gap and center distance. Four-way rapid traverse. Thirty-six spindle speeds are available, 5 to 500 rpm. Sixty feeds and threads. And, of course, you get all the well-known LeBlond features—hardened and ground steel bed ways, totally enclosed quick-change box, automatic lubrication, one-piece apron, thrust-lock tailstock and many more.

Whether your turning jobs call for versatility or production, heavy hogging or fine finishing, there's a LeBlond Lathe to turn them better, faster. Your LeBlond Distributor will tell you about the three Sliding Bed Gap Lathes, 16"/38", 25"/50", and 32"/60". Call him or write The R. K. LeBlond Machine Tool Company, Cincinnati 8, Ohio.

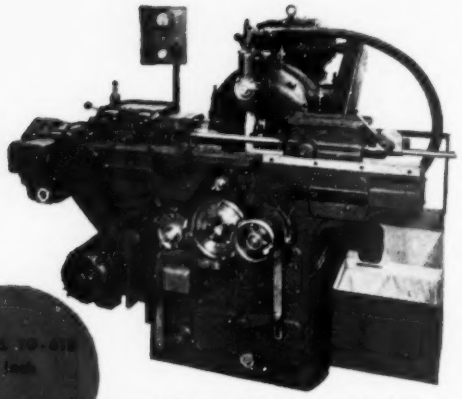
Ask for Bulletin SBG-103A for more information on LeBlond Sliding Bed Gap Lathes.

Cut with Confidence

LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS*

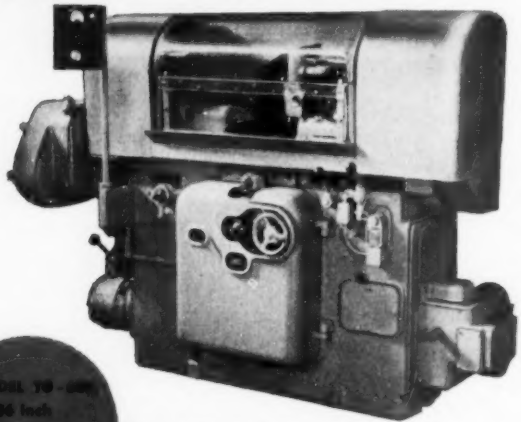


Quality threading
AT MINIMUM COST

The 6 x 18 Automatic Thread Grinder is used for high production thread grinding with either single or multi-ribbed wheels on relatively small parts.

JONES & LAMSON
AUTOMATIC THREAD GRINDERS:

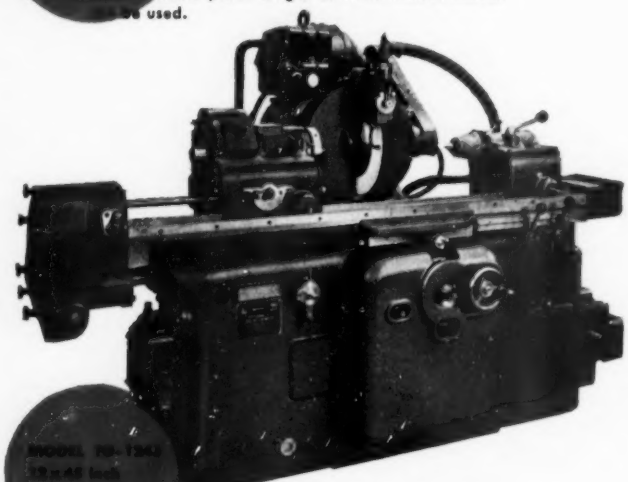
- Produce threads of better quality and more uniform finish
- Reduce handling cost
- Eliminate costly rethreading after heat treatment
- Eliminate expensive retooling when specifications change
- Reduce cost of gage maintenance



The 4 x 36 machine is extremely versatile and is used on long or short run jobs on a great variety of precision threaded parts. Single or multi-ribbed wheels can be used.

Built-in accuracy and automatic features, make any of these machines a paying investment for toolroom or production line.

- Automatic wheel truing
- Automatic infeed on successive cuts
- Automatic sizing
- Rheostat wheel speed control
- Diamond or crush dressing of wheels
- Multi-ribbed threading
- Right and left hand threading



The 12 x 48 machine is used for grinding threads on a wide range of work from small to large heavy parts. Single or multi-ribbed wheels can be used.

When measuring the value of a thread grinder remember the extra benefits of J & L top-flight construction. Write Dept. 710 for illustrated catalog.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L **THREAD GRINDER DIVISION**

Take two looks at this map...

It's Your Guide to Monarch Sales and Monarch Service

How to buy a Monarch Lathe? Simple! Get in touch with your branch office or distributor (see map above). They'll give you our full story in type and pictures—show you a sound movie of the machines—arrange for job studies, if you wish—plan a field demonstration or a visit for a factory demonstration. If you're not sure which office to contact, write us and you'll find the right man on your doorstep—quick!

How to get service for your Monarch? It's just as easy—for the Monarch service plan is second to none in speed and efficiency. Resident factory-trained service engineers are strategically located around the country. Each man travels his territory constantly, demonstrating machines, instructing operators and following installations. He'll be in your plant in a hurry any time he's wanted. Just call your Monarch branch office or distributor.

We've been able to build this topflight sales and service organization only because of the great demand for the Monarch line of proved-in-performance lathes. Challenge us to improve your performance on any turning problem! *. . . The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

BRANCH OFFICES

CHICAGO, ILLINOIS. The Monarch Machine Tool Co., 6645 West North Ave., Oak Park, Ill.

CINCINNATI 37, OHIO
The Monarch Machine Tool Co., 7373 Brookcrest Drive, Roselawn Ctr. Bldg., Office C-17.

CLEVELAND 18, OHIO
The Monarch Machine Tool Co., 3091 Mayfield Road.

DETROIT 21, MICHIGAN. The Monarch Machine Tool Co., 16622 James Couzens Highway.

INDIANAPOLIS 5, INDIANA. The Monarch Machine Tool Co., Maco Building, Room 12, 709 East 38th St.

MONTCLAIR, NEW JERSEY. The Monarch Machine Tool Co., 484 Bloomfield Avenue.

PITTSBURGH 22, PENNSYLVANIA
The Monarch Machine Tool Co., 512 Empire Building, Liberty Ave. and Stanwix St.

DOMESTIC DISTRIBUTORS

ATLANTA 3, GEORGIA
Noland Co., Inc., 512 Spring St., N. W.

BIRMINGHAM 3, ALABAMA
Noland Co., Inc., 2204 First Ave. South.

BOISE, IDAHO
M. R. Priest & Sons, 515 Highland St.

BOSTON, MASSACHUSETTS. Wigglesworth Machinery Co., 199 Bent St., Cambridge 41, Mass.

BUFFALO, NEW YORK. G. W. Brunton and Son, Inc., 2315 Elmwood Ave., Kenmore 17, New York.

CHARLESTON, WEST VIRGINIA
Wm. S. Bolden Co., Inc., 814 East Washington St.

CHATTANOOGA 1, TENNESSEE
Noland Co., Inc., 115 Market St.

DALLAS 19, TEXAS
Greene Machinery Co., 6300 Wycha Blvd.

DAYTON 2, OHIO
C. H. Gosiger Machinery Co., Bacon & McDonough Sts.

DENVER 4, COLORADO
F. J. Leonard Co., 1219 California St., Room 201.

DURHAM, NORTH CAROLINA
George A. Marshall Machinery, 225 Monmouth Ave.

GREEN BAY, WISCONSIN
Bay Verte Machinery Company, 127-131 N. Pearl St.

HOUSTON 1, TEXAS. Steel & Machine Tool Sales Co., 6416 Navigation Blvd., P. O. Box 1716.

KANSAS CITY 6, MISSOURI
Fuchs Machinery & Supply Co., 1823 Walnut St.

LOS ANGELES 58, CALIFORNIA
Moore Machinery Company, 3876 Santa Fe Avenue.

MINNEAPOLIS 1, MINNESOTA
The John C. Eide Co., 200 Washington Ave., North.

NEW ORLEANS 6, LOUISIANA. Dixie Mill Supply Co., Inc., Tchoupitoulas & St. Joseph Sts.

OMAHA 2, NEBRASKA
Fuchs Machinery & Supply Co., Jackson at 15th St.

ORLANDO, FLORIDA
Harry P. Lau, Inc., 100 W. Livingston Ave.

PHILADELPHIA 4, PA. Machinery Associates, Inc. 325 E. Lancaster Ave., Wynnewood, Pa.

PORTLAND, OREGON. Hallidie Machinery & Equipment Co., 525 N. Tenth Street.

ROCHESTER 4, NEW YORK
G. W. Brunton & Son, Inc., 703 Temple Bldg.

ST. LOUIS 6, MISSOURI. Calcord-Wright Machinery & Supply Co., 1223-1229 North Broadway.

SALT LAKE CITY 4, UTAH
The Galigher Company, 545 West Eighth South St.

SAN FRANCISCO 7, CALIFORNIA
Moore Machinery Company, 700 Minnesota Street.

SAN JOSE 13, CALIFORNIA
Moore Machinery Co., Porter Building.

SEATTLE 8, WASHINGTON
Hallidie Machinery Co., Inc., 210 Hudson St., South.

SHREVEPORT 93, LOUISIANA. Dixie Mill Supply Company of Shreveport, 200 Edwards Street.

SYRACUSE 2, NEW YORK. The H. A. Smith Machinery Co., 705 Syracuse-Kemper Bldg.

TULSA 3, OKLAHOMA
Gorton-Howell Machinery Co., 215-217 East First St.

WASHINGTON 6, D. C. Shirley, Olcott & Nichols, 726 Mills Building, 17th and Pennsylvania Avenue.

WEST HARTFORD 7, CONNECTICUT
O. C. Stevens Machinery Co., Inc., 76 LaSalle Road.

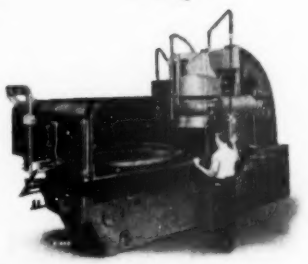
Put it on the Blanchard . . .
it takes 1/5th the time!

Here is another example of the high production attainable while grinding to extremely close tolerances with Blanchard Surface Grinders and Blanchard Wheels.

It formerly took 45 hours, floor-to-floor, to grind these nine hardened steel machine tool ways. They are 2½" x 3½" x 50" and hardened to Rockwell C-60-63.

Now, these highly desirable results are obtained, using a No. 42-72-84 Blanchard Surface Grinder — nine are placed on the chuck and ground on 6 sides, removing .015" from each surface, parallel to .0001", flat within .0001" with surface finish of 5 micro-inches. The Blanchard **cut time to 9 hours,** floor-to-floor!

No wonder production men say: "Put it on the Blanchard — it takes less time to do a better job".



This is the largest Blanchard Surface Grinder, No. 42-72-84.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

Facts you should know about Kearney & Trecker's Special Machinery Division

If you're a potential buyer of special machines or special tooling – read about our expanded facilities

THOUGH we've been designing and building standard and special machine tools since 1898, limited production facilities for special machines previously prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or specially to adapt standard equipment to solve specific metalworking problems.

Check our qualifications:

EXPERIENCE: We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our production of special machinery has ranged up to $3,000,000 annually.*

FACILITIES: The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than *$2,500,000 worth of new tools and equipment.*

PERSONNEL: The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying to metalworking the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

PERFORMANCE: Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These include high production requirements as well as exacting dimensional accuracies and surface finishes.

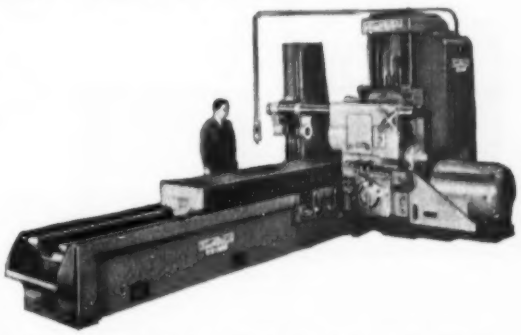
RESPONSIBILITY: Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a 50 hp CSM Simplex milling machine we designed and built for a leading manufacturer.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

GRITCLOTH

OPEN MESH SANDING FABRIC

REVOLUTIONARY DISCOVERY... "HEARD 'ROUND THE WORLD"!

PATENT APPLIED FOR

The world-wide demand for our latest abrasive development, GRITCLOTH, has already forced us to increase our production capacity. Right now we are keeping abreast of the still growing clamor for this most advanced sanding material.
GRITCLOTH gives the removed particles a place to go and thereby maintains fast cutting action throughout its amazingly long life.
For machine and hand sanding or polishing . . . wet or dry . . . it's GRITCLOTH. Order now!

Excellent for fast, smooth rubbing of prime coats on all boat and marine finishes. Extra-long life whether you use GRITCLOTH wet or dry.

Outstanding results from leading car manufacturers using GRITCLOTH for wet prime-coat sanding. BOTH SIDES OF GRITCLOTH are used, for maximum life.

New production speeds in all metal fabrication finishing and deburring. Less down-time means more production and less cost with GRITCLOTH.

Non-loading feature gives GRITCLOTH tremendous advantages in speed and amount of material removed. GRITCLOTH saves you money on machine or hand polishing.

★ **10 to 15 TIMES LONGER LIFE than the conventional types of coated abrasives.**

★ **APPLICATIONS ARE LIMITLESS . . . each day finds a new successful operation for this Miracle Modern Sanding Fabric.**

★ **NON-LOADING... OPEN MESH LETS THE REMOVED PARTICLES FLOW RIGHT THROUGH.**

★ **THOUSANDS OF SUPER-SHARP EDGES KEEP ON CUTTING.**

★ **USE WET OR DRY**

★ **FLAT OR FOLDED**

★ **BY MACHINE OR HAND**

★ **BOTH SIDES**

Where can YOU use it?

GRITCLOTH...
a BAY STATE Pioneered Product

BAY STATE

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U. S. A.
Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

MATERIAL: 11" dia. blank of .051" 2SO aluminum.

▲ FIRST OPERATION: Draw a 5" dia. cup, 4½" high. At completion of the draw, but before retracting the punch, a ring is placed over the part which, when pressure is re-applied, trims the cup flange. The trimmed cup is stripped as the punch is retracted.

▶ REDRAW OPERATION: One continuous draw forms the cup into a box, 3⅛" x 3½" x 5¾" high.

redrawing a round into a square by Hydroforming

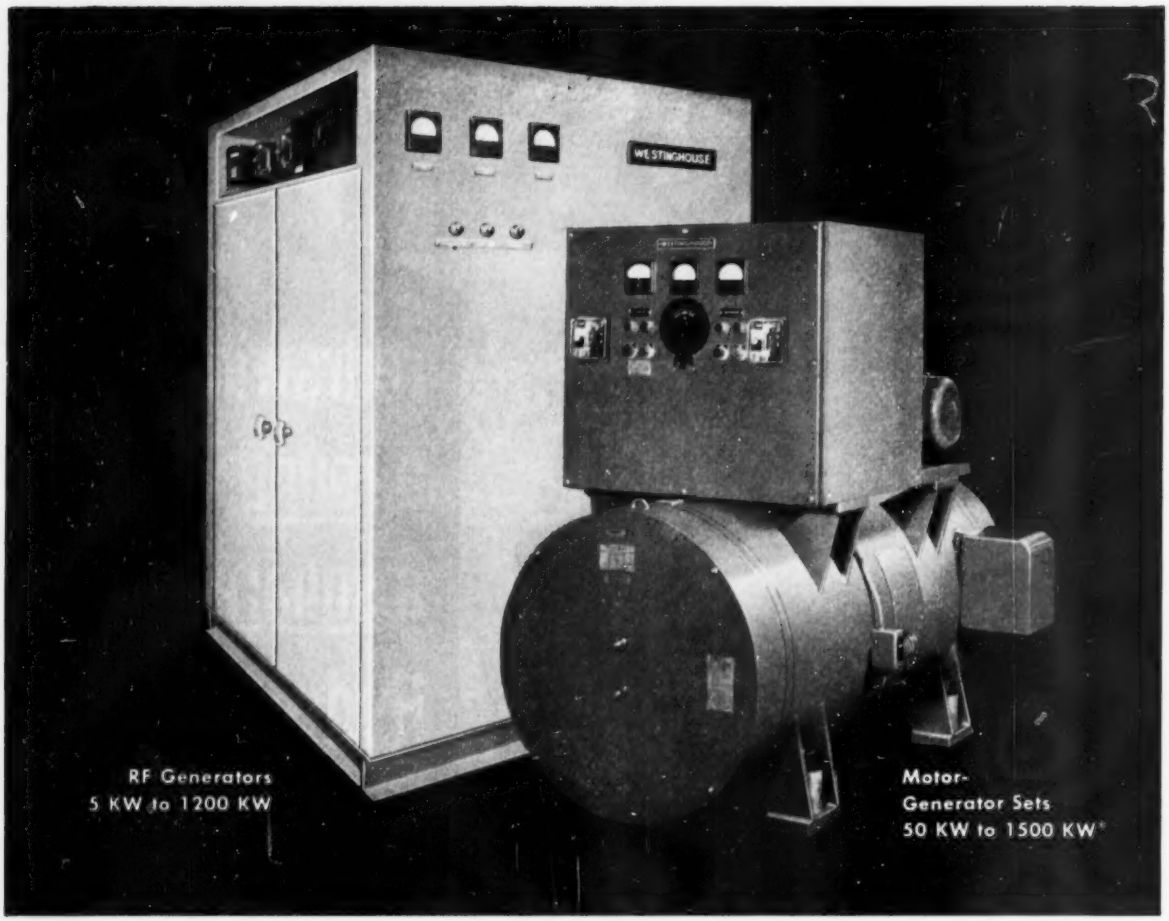
Here's a dramatic, new *switch* to the "can't fit a square peg into a round hole" story . . . the Cincinnati 12" Hydroform version: Draw a round cup, then redraw it, producing a deep, rectangular box!

Try this on your draw press in *two forming operations* . . . then compare your conventional tools—their cost and complexity—with these: A punch and a draw ring to produce the cup . . . a ring to trim the cup flange . . . a redraw sleeve with square opening, which is placed into the first operation draw ring to accommodate the predrawn cup . . . and a finish punch to form the box. Of these five, simple Hydroform tool elements, only the finish punch and the internal opening of the redraw sleeve could not be machined on a lathe.

This is another example of the *unique* drawing action—the *simplicity* and *economy* of tooling—the *savings* of operations—made possible by Hydroforming. Can your company use these Hydroforming advantages? Find out now, by calling in a Cincinnati Milling field engineer. For a description of the Hydroforming process and specifications of the 12", 19", 23", 26" and 32" machine sizes, write for Bulletin M-1759-2.

CINCINNATI Hydroform

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.



FOR INDUCTION HEATING— SPECIFY WESTINGHOUSE

Leader for Years in Total KW in Use—Years of experience gained by Westinghouse from hundreds of induction heating installations throughout industry can be applied now to your own heat-treating needs. You are assured of reliability – proved by the fact that the total kilowatt-hours generated by installed Westinghouse induction heating equipment has exceeded, year in year out, that of any other manufacturer.

And you know that Westinghouse, as a manufacturer of both motor-generator and radio-frequency-generator induction heating units, is in a position to recommend equipment without bias for your specific requirements. Whatever your heat-treating problem, inquire about these efficient, versatile tools now. Call your Westinghouse representative or write: Westinghouse Electric Corporation, Electronics Division, Induction Heating Section, 2519 Wilkens Avenue, Baltimore 3, Maryland.

**Higher ratings can be supplied for any specific purpose.*

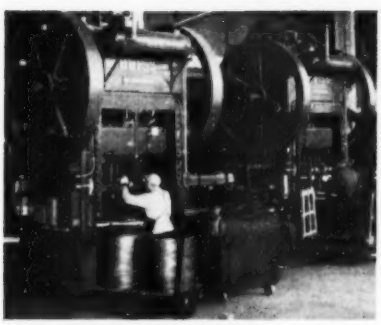
J-02271

YOU CAN BE SURE...IF IT'S

Westinghouse

Punching 7,000 holes in 90 seconds with the BLISS perforating press!

Each hole precisely located and burr-free on wrap-around stamping for Lovell dryer



TWO NEW BLISS S-2 PRESSES team up at Lovell. Each has 175 tons capacity. At left: forming a dryer inner drum head. At right: piercing a cylindrical exhaust duct.

Take a sheet of 0.037 steel, 19″ x 77″, then pierce out 67% of the area with 7,000 precise perforations. And do it continuously day in and day out at the rate of one every 90 seconds. That's how Lovell Manufacturing Co., Erie, Pa., produces its dryer wrap-around stamping with a Bliss No. 875 High Speed Perforating press. Average speed is 160 strokes per minute with a 64 punch tool.

Press accuracy and rigidity are extremely important to insure exact alignment of the comparatively fragile punches. A specially-designed Bliss feeding mechanism, built-in safety devices and accurate back gages guard against miscuts.

BLISS on your press is more than a name... it's a *guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

E. W. Bliss (England) Ltd., Derby, England • E. W. Bliss Company (Paris), St. Ouen sur Seine, France

U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan. *Branch Offices* in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. *West Coast Representatives:* Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. *Other representatives throughout the world.*

MAKE YOUR TOUGH PRESSING PROBLEMS SAY "UNCLE"

WITH A KRW HYDRAULIC PRESS!

Here are a few "case histories" of KRW Hydraulic Press performance in metalworking plants. There are hundreds more in the files of our Sales Department, proving that a KRW Hydraulic Press cuts costs, saves time and labor, and improves quality in your type of work. Available in one, two and three cylinder models, hand, air or motor driven; 25-150 tons. If you need a special Press we'll build it for you.

Look over the jobs KRW is doing for other companies. Chances are, you have a pressing problem similar to one of these. And KRW can help you solve it. Write, wire or phone for complete specifications and prices. Dep't. 11.

PRODUCTION **Phinney Tool & Die Co. bought this press to test large dies which they were making for a manufacturer of tank parts. Later it developed that the manufacturer didn't have proper equipment to put the dies into production. So the dies were sent back to Phinney with instructions to produce the tank parts on the same press that had tested the dies. As a result, this KRW Hydraulic Press has since produced thousands of tank parts in addition to its regular work of testing dies.**

STRAIGHTENING AND RESIZING **Setting rivets, driving home T-handles to prevent loosening, straightening C-Clamps that bent as they cooled, resizing distorted plungers, straightening distorted cams and feet on eccentric clamps — these are just a few of the trouble-shooting jobs this KRW Hydraulic press does for Batavia Clamp Co. You too can do straightening work faster, at less cost, with this type of KRW motor-driven Hydraulic Press.**

DIE TRY OUT Versatility counts high on this job. Whether die making itself is your business or whether you're testing dies for use in your own production, a KRW Hydraulic Press will soon pay for itself in time and money saved. With a KRW Press, you *know* dies will work in production. Converts in minutes from one setup to another and gives you the extreme accuracy needed in die testing.

BENDING Here's versatility with a capital KRW! This press was originally purchased to do one job and is now performing 15 different operations for a manufacturer of dry cleaning equipment. The customer voluntarily told us: "We bought this press late in 1950 and it's paid for itself ten times over."

You can't lick this stamp!
. . . It was done on a KRW Hydraulic Press . . . famous for doing all kinds of stamping work faster, better, at less cost!
K·R·WILSON

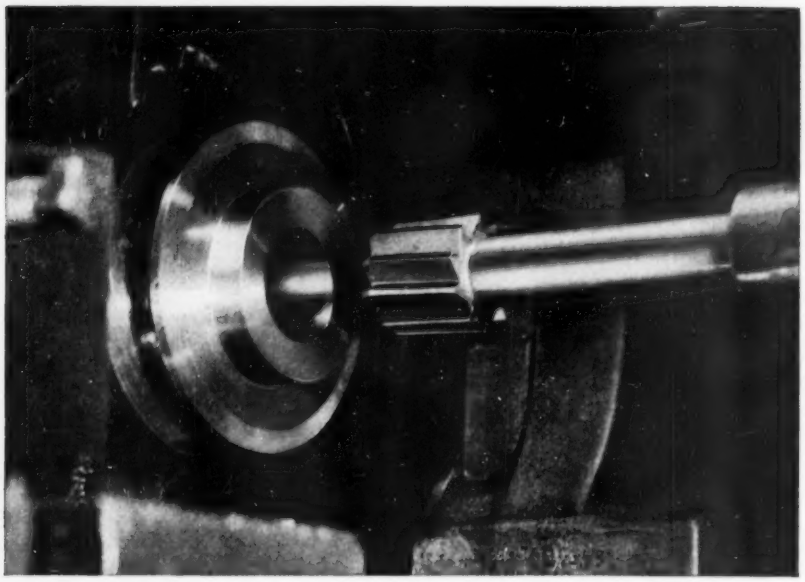
STAMPING serial numbers on water meter lids was a problem for this company. It was being done on a hand press *after* the hinged lid was attached to the meter housing. Result: Bad register or "sprung" lids due to variations in pressure. A 25-ton KRW motor-driven Hydraulic Press solved the problem. Each stroke of the KRW Press produces the same amount of pressure. There are no more "sprung" lids; each number is in perfect register, and production is 4 times greater!

DEEP DRAWING & FORMING KRW Hydraulic Presses are especially suited to deep-drawing work because they produce maximum pressure at any part of the stroke. Ram can be eased down to the work and stroke can be adjusted to handle several different drawing jobs. You get greater accuracy, minimum rejects, faster production.

K·R·WILSON

215 MAIN ST., BUFFALO 3, N. Y.

Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!

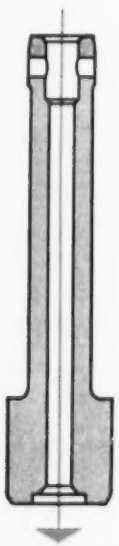


REAM FINE FINISHES

ON SCREW MACHINES AND TURRET LATHES

20-25 micro-inch finish

Reamed finishes which were never considered possible are now obtained on production jobs with Barber-Colman Oil-Feed Reamers. On this job, 1000 pieces were reamed to a surface finish of 20-25 micro-inches before it was necessary to sharpen the reamer. The feed is 1.75″ per minute at 280 RPM, requiring 30 seconds to ream the 7/8″ length of cut. The material is AISI C 1137 steel. Finishes like this can be obtained in regular production with Barber-Colman Oil Feed Reamers.



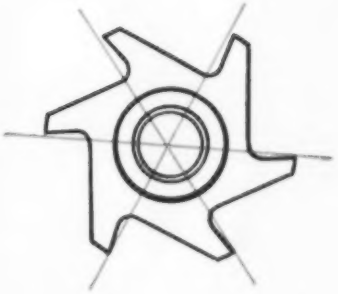
oil feed

An outstanding feature of these oil-feed reamers is that the oil feeds through the body of the reamer to flush the chips away from the cutting area. Other types of reamers tend to pack the chips in front of the reamer, increasing the chance for "pick up" which often ruins the finish and shortens the life of the tool. As the oil hits the end of the hole, it is forced back between the flutes, carrying the chips with it. Another aid to extending tool life is that the oil reaches the cutting area on jobs which could not otherwise effectively employ a free flow of coolant.

DESIGNERS OF STANDARD AND SPECIAL

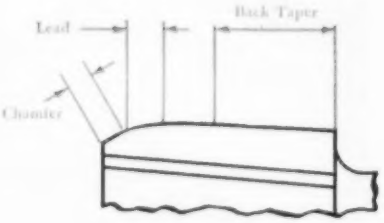
irregularly-spaced flutes

Irregular spacing is a standard feature of all Barber-Colman Oil-Feed Reamers. This type of spacing provides a smooth cutting action and fine finish and prevents the reamer from forming "welts". Thus, the design of the spacing in conjunction with the oil-feed feature allows these reamers to produce surface finishes which formerly required a secondary finishing operation. To aid in checking the reamer diameter, the flutes are spaced diametrically opposite each other so that they can be inspected with a micrometer.



cam-controlled sharpening

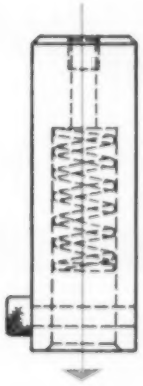
The profile form on the reamer flutes is important in obtaining the best finish and tool life. Following a 30° chamfer, the lead is blended into a radius and followed by a straight portion which irons out the feed marks. This combination produces exceptionally fine finishes. Also, through the use of the Barber-Colman system of sharpening, a theoretically sharp cutting edge is produced rather than a cylindrical land. The Barber-Colman system is cam-controlled so that each reamer is sharpened with exactly the same profile. These are features which are available in no other type of reamer.



self-centering floats

These spring-type floats hold the reamer firmly, eliminating any sagging. Its simple design, consisting of only the holder, drive pin and spring, makes it easy to operate and maintain. An opening through the center of the float allows the oil to reach the reamer. Only two floats are required to cover the complete range of sizes, although a float of extra length is available for the larger sizes. These reamers are available for diameters of .344″ through 1.380″.

Ask for new bulletin listing specifications and prices or call your nearest Barber-Colman representative.



HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 0111 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

METAL CUTTING TOOLS SINCE 1908

The element of

PRIDE IN CRAFTSMANSHIP

Pride plays a big part in how well a man does his job. At American Welding, AWQ symbolizes American Welding Quality. To 800 craftsmen skilled in the art of forming, welding and machining of rings, bands and assembled components it is a constant reminder that know-how and good equipment are not enough. Every man must constantly strive to do his best.

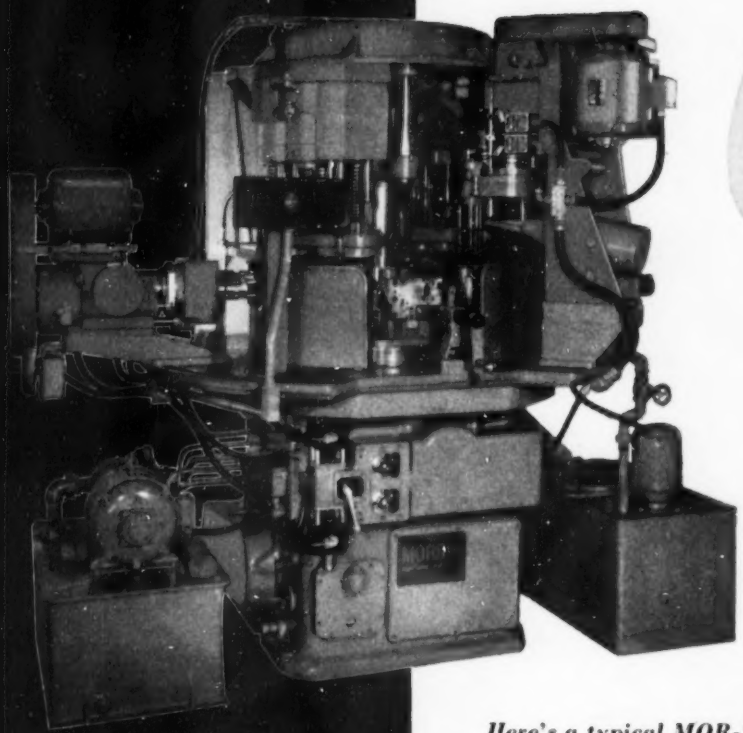
It is this pride in one's job that enables American Welding to produce welded components with the same care that you would use in your own plant. So, if your problem can be solved by welding — either fusion or resistance — of any type of material — or a component or part that can be joined by welding — call your local Amweld representative or write us. We will be happy to put plant facilities, 35 years of experience, and most important, men with pride in AWQ, to work for you.

A company you'll like to deal with

THE AMERICAN WELDING & MANUFACTURING COMPANY • WARREN • OHIO

how little does it cost...

to get "special machine" production with combination standard units?



Producing 170 finished transmission control valve bodies per hour at 100% efficiency, this machine performs 32 drilling and tapping operations in two cycles.

Here's a typical MOR-SPEED answer to an ever-more important problem:

A combination of Morris standard units . . . center column, base, indexing mechanism and hydraulic units . . . plus a made-to-order vertical and auxiliary side heads . . . make up this high production machine. Cost is less, delivery faster . . . the user gets the accuracy and low cost production of a "special" without the usual sky-high costs and limited application of conventional units.

Consider the multiple savings . . . investment, labor, time and floor space . . . of MOR-SPEED multiple machining. Let Morris Engineers prove that high production *and* precision can be yours for less than you might imagine.

a better product at less cost with precision - plus production

Builder of MOR-SPEED Line

Morris

THE MORRIS MACHINE TOOL CO.

933 HARRIET ST., CINCINNATI 3, OHIO

how Tinnerman Products solved

a tough heat-treating problem:

with **Gulf Super-Quench**

- minimum hardness was increased from 50 to 60 RC
- variation in hardness was reduced from ±5 to ±2 RC

on AISI C-1064 STEEL

Tinnerman Products, Inc., Cleveland, Ohio, manufactures a large variety of spring clips and spring fasteners of the type pictured at the left. These parts range in thickness from .01 to .062 inches and are all made of AISI C-1064 spring steel.

Normal heat treating practice calls for heating to 1600 deg. F. in a controlled atmosphere. The parts are held at this temperature for approximately ½ minute, then are transferred by a shaker-type conveyor into the quenching bath, which is held at 120 to 125 deg. F. After quenching, the parts are tempered at 700 deg. F.

When Tinnerman used a conventional quenching oil, hardness varied from 50 to 60 RC—too low and too variable for suitable performance characteristics. Examination of the steel revealed that in all cases it was within specification limits.

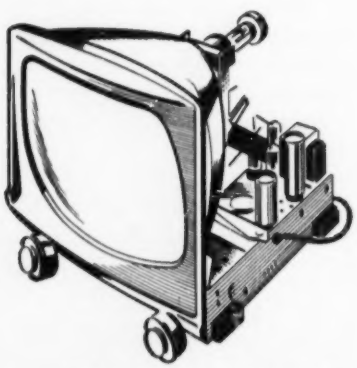
After investigating a number of other quenching oils, Tinnerman Products discovered one that is outstanding—Gulf Super-Quench. Tinnerman Products is now quenching all of these parts in Super-Quench with remarkable results. Hardness is never lower than 60 RC and averages 62 ± 2. This improvement was obtained without any change in quenching temperature, degree of agitation, analysis, or grain size.

If you, too, are looking for ways and means to increase the efficiency of your quenching operation, it will pay you to investigate the advantages of Gulf Super-Quench. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company
Pittsburgh 30, Pennsylvania

GULF SERVES INDUSTRY

UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—#4 to 1"—in a full range of lengths.



USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used . . . on radios, television sets and electronic equipment.

On refrigerators, washers, other household appliances

9 times out of 10 a standard UNBRAKO will do the job

A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for a copy of UNBRAKO Standards. SPS, Jenkintown 1, Pa.

UNBRAKO® SOCKET SCREW DIVISION

SPS
JENKINTOWN PENNSYLVANIA

On power mowers, power saws and other power tools.

UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

precision meets production

When precision meets production . . . the result is profits! That conclusion has been proved again and again by Lodge & Shipley Lathes.

Each type of Lodge & Shipley Lathe has many special advantages, some of them exclusive developments. They all have a common purpose, more production, greater accuracy and lower cost. They all have set notable records in American and foreign industry.

Even if your present lathes were "the last word" only a few years ago, you should investigate Lodge & Shipley's contribution to "more production through modernization."

A Lodge & Shipley representative will gladly survey your work. He'll show you, with comprehensive case histories, how Lodge & Shipley Lathes are setting production records on comparable work.

THE LODGE & SHIPLEY CO.
3055 Colerain Avenue, Cincinnati 25, Ohio

Lodge & Shipley

....your **LODGE**-*ical choice!*

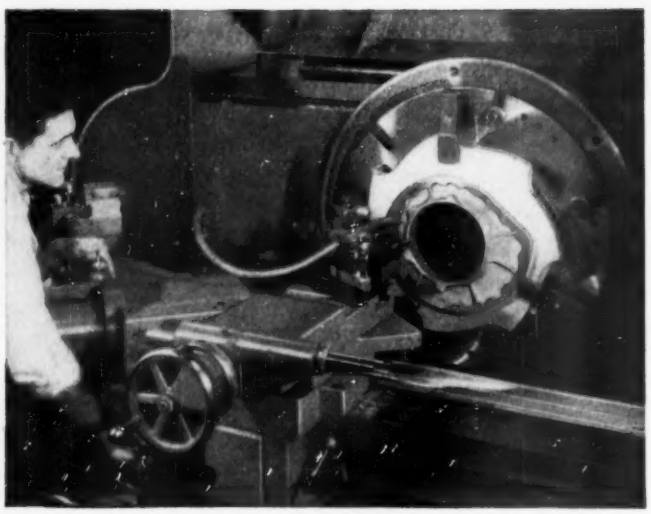
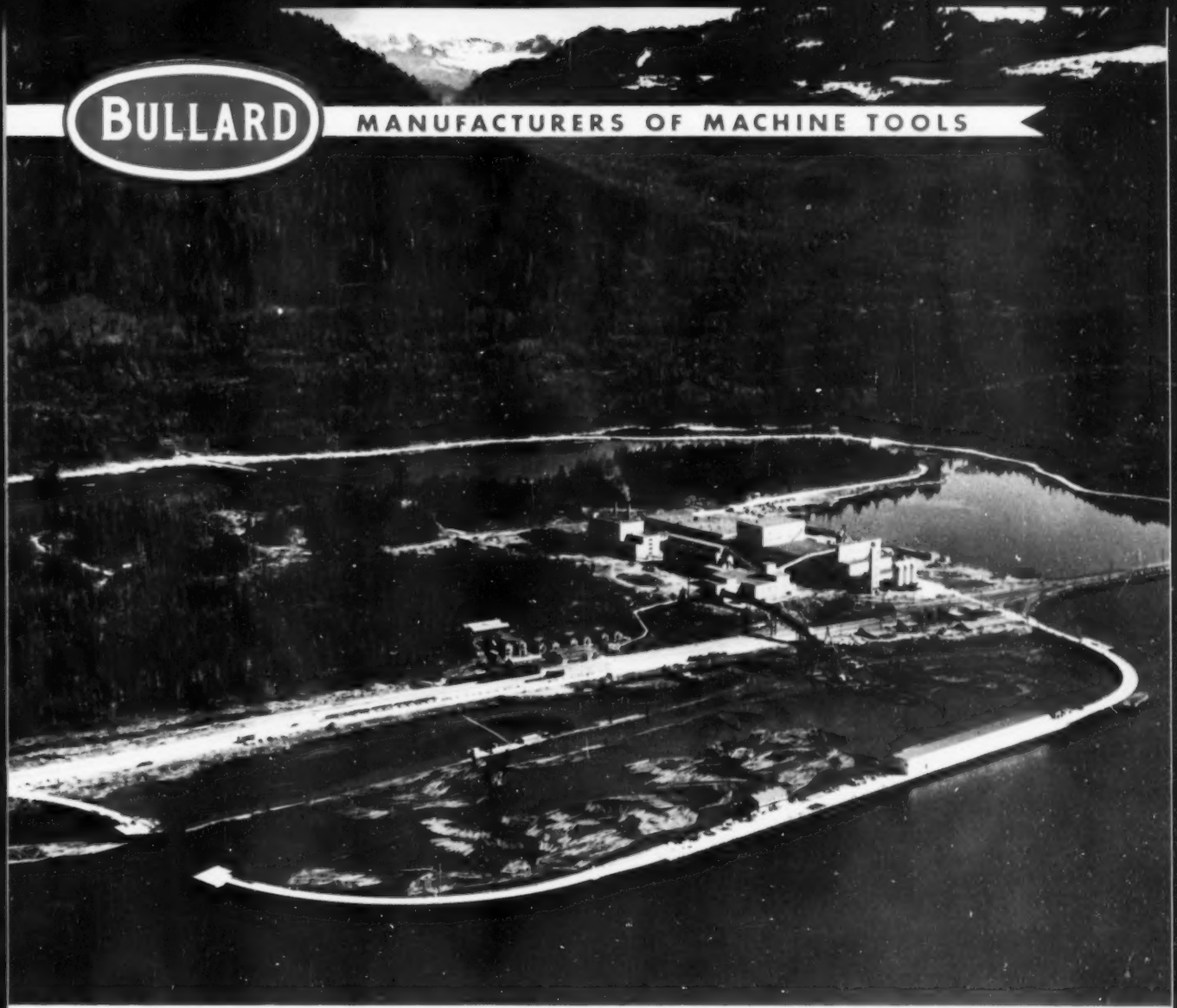


Illustration shows the Lodge & Shipley T Lathe machining thin wall, large diameter workpiece at Hotpoint Co.*

*T/M The Lodge & Shipley Co.

BULLARD

MANUFACTURERS OF MACHINE TOOLS



A Large Operation in the Logging Industry

Celanese Corp. of America Photo

The Invisible Background of Industrial Progress

No doubt the general conception as to the importance of the logging industry is in its direct contribution to the building of homes, furniture and other wood products and structural forms.

It is our purpose here to point out that this industry enters into the making of paper, plastics, material for wearing apparel, upholstery of all kinds, innumerable gadgets and toys — all part of the American home. These things all emanate from "The Invisible Background of Industrial Progress."

★ In this "Invisible Background" are *Modern Machine Tools* — the manufacturing equipment which enables producers to make and distribute their products at a cost equitable with the economic structure of free enterprise.

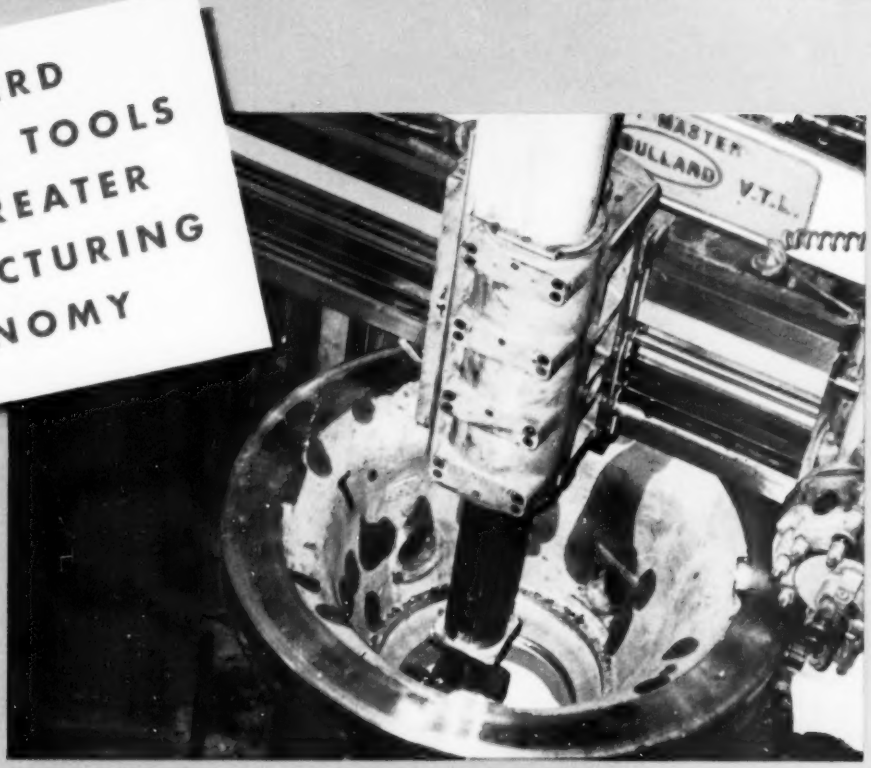
Bullard Machine Tools have in the past and will continue to play an important role in economic manufacturing progress.

★ *For greater manufacturing economy REFER to next page.*

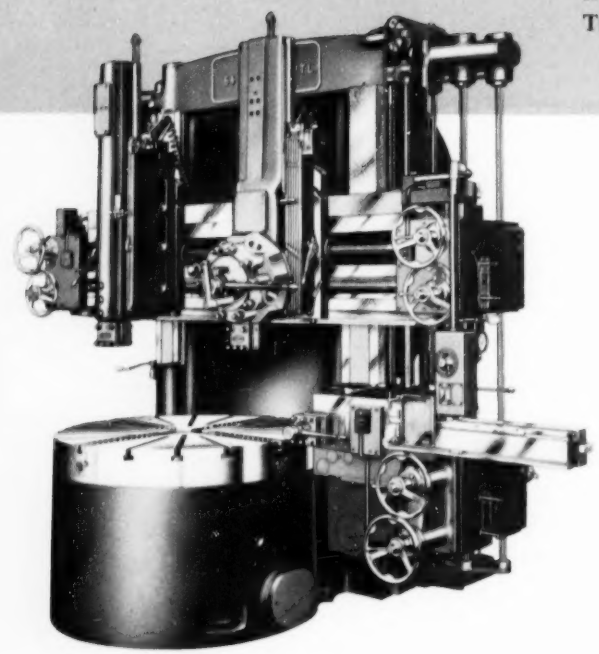
THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY



Whether the work be large or small, single piece jobs or longer production runs, The Bullard Cut Master Vertical Turret Lathe is a machine designed to meet your requirements.



Rigidly constructed with "built in" accuracy, the Bullard Cut Master Vertical Turret Lathe, available in six sizes, is everything its name implies — and more.

Versatility, accuracy and efficiency mean greater manufacturing economy, and in today's competitive market these factors cannot be overlooked.

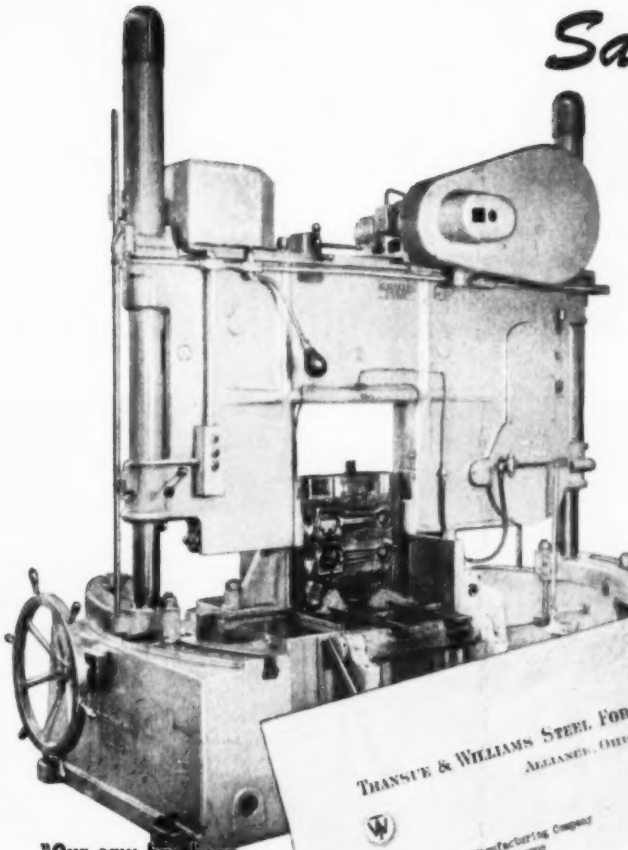
Let Bullard show you how the Cut Master Vertical Turret Lathe can increase your manufacturing economy by cutting time on cuts and cutting time between cuts.

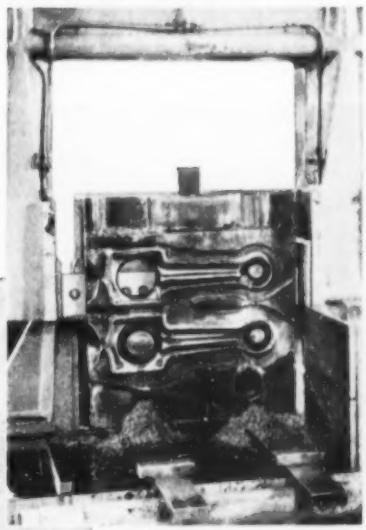
BULLARD

Time saved is money earned. Write now for complete information.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

Save 25% Time in Re-facing Dies... 20% Time -plus steel- in Shanking Them





Trimming the worn impression from the face of a 20" x 24" die block with a No. 24 MARVEL Universal Hydraulic Roll Stroke Hack Sawing Machine. Average Blade Cost $.0108 per square inch.

"Our saw has been in operation 2 years. Most of our sawing has been on die blocks..."

"We are removing the worn impression from the face of die blocks for resinking ... we recently removed 2 inches from face of blocks measuring 19" x 17" ... sawing time 296 minutes for 2 blocks ... Set up time 31 minutes ... grinding time 155 minutes ... total 8 hours and 2 minutes.

"Average time for removing same amount of stock from these die blocks with planer, 10 hours and 15 minutes. Sawing saves approximately 25% of time ...

"With regard to removing excess stock to provide shanks ... we remove approximately 90% of metal by sawing after which block is sent to planer for finishing. Time for sawing and planing is 20% less than planing alone.

"Pieces of stock removed by sawing are useful in many ways ... saves buying of some trimmer steel."

TRANSUE & WILLIAMS STEEL FORGING CORPORATION
ALLIANCE, OHIO

Armstrong Blum Manufacturing Company
5706 W. Bloomingdale Avenue
Chicago 39, Illinois

Gentlemen:

We feel that you would be interested in having some of the data we have compiled on our No. 4 24 Marvel Metal Cutting Saw. As you know, our saw has now been in operation approximately two years. Most of our sawing has been on die blocks furnished us either by the Heppenstall Company or A. Finkl & Son Company.

We wish to advise you that we are removing the worn impression from the face of die blocks for resinking with the use of this saw and find that it works to a very definite advantage, depending somewhat on the amount of stock to be removed from the face of the die. On a job which we recently removed two inches from the face of blocks measuring 19" x 17", our sawing time was 296 minutes for the two blocks, set-up time was 155 minutes, and the time required for grinding the face after sawing was 31 minutes, total 482 minutes or 8 hours and 2 minutes. To remove the same amount of stock from these blocks with our planers, over an average of eight sets of dies required 10 hours and 15 minutes for planing and grinding, or approximately 25% additional time. We might point out that our labor rate for a saw operator is less than that being paid to a planer operator, which further increases the saving somewhat. From our experience, we find where only one inch is to be removed from the face of the die, the saving is somewhat less, but in no case has been very definitely in favor of the saw.

With regard to removing the excess stock to provide shanks on our dies, this naturally varies with the size of blocks and the depth of the shank involved. However, our average over a year and a half period has directed to us a saving of 70% in other words, we require approximately 90% of the metal by sawing, after which the blocks are sent to the planer for finishing the shanks. The total elapsed time for the sawing and planing on have found to be 20% less than that required by planing alone. We should also like to point out that the pieces of stock removed by the sawers useful to us in many ways and has eliminated the necessity of buying some of our trimmer steel.

Perhaps you also would be interested in our blade life and blade cost. We have found that with an original blade and having it resharpened twice, we are able to cut 2,500 square inches. The cost of the blade being as

Write for Catalog of MARVEL Modern Metal Saws

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 W. BLOOMINGDALE AVE. CHICAGO, (39) U. S. A.

U·S·S CARILLOY Steel in rolled sections . . . . . .

LANDING FLAPS on the Model 340 Convair airliner slide on tracks made of CARILLOY 4140 steel T-sections. These tracks are much stronger than those formerly made from rectangular bars. And they cost 75% less!

lops 4 hours off machining time,

provides stronger flap tracks for Convair airliners

and cuts costs 75%

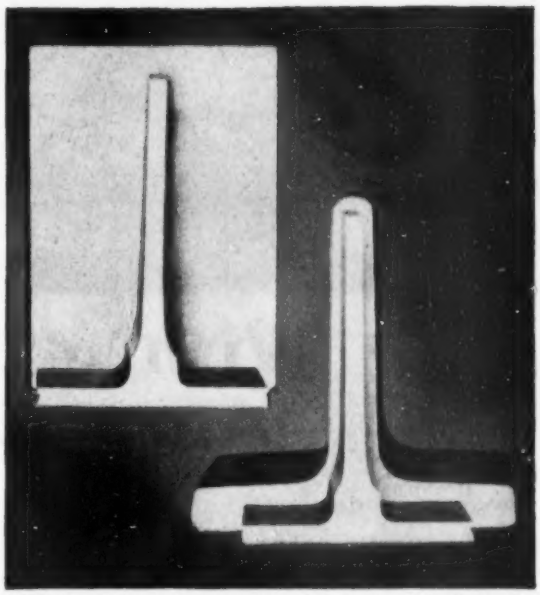
● Wing flap supports for Consolidated Vultee's Model 340 Convair airliners are stronger, cost *less*, and are of better quality now that they are made from hot-rolled sections of U·S·S CARILLOY steel.

When J. C. Peacock Co., of Los Angeles, California, started making these T-shaped flap tracks for Convair, the accepted practice was to machine them from 2¼" x 3¼" bars of alloy steel. But machining took a lot of time, and more than 50% of the stock metal was wasted in scrap.

Peacock and Convair engineers studied the problem and soon realized that they could shorten machining time and reduce scrap losses by fabricating directly from rolled sections. The question was, where to find a good supply of steel that would meet all the exacting quality requirements? Our Columbia-Geneva Division came through for them, by providing hot-rolled T-sections of CARILLOY 4140 steel.

This steel is giving excellent results. Not only are the CARILLOY parts *stronger* than those formerly used, but they require 4 hours less machining time, and reduce scrap losses 60%. What's more, finished tracks now cost only *one-fourth* as much as they did before.

Our experienced steel engineers and metallurgists may be able to help you make similar savings on *your* products. Call our nearest District Office. Chances are we can supply just the steel and the form you need.



LEFT, the T-shaped cross-section of a flap track in front of a 2¼" x 3¼" steel bar shows how much metal was formerly wasted.

RIGHT, the same flap track in front of the CARILLOY T-section that cuts scrap loss 60%.

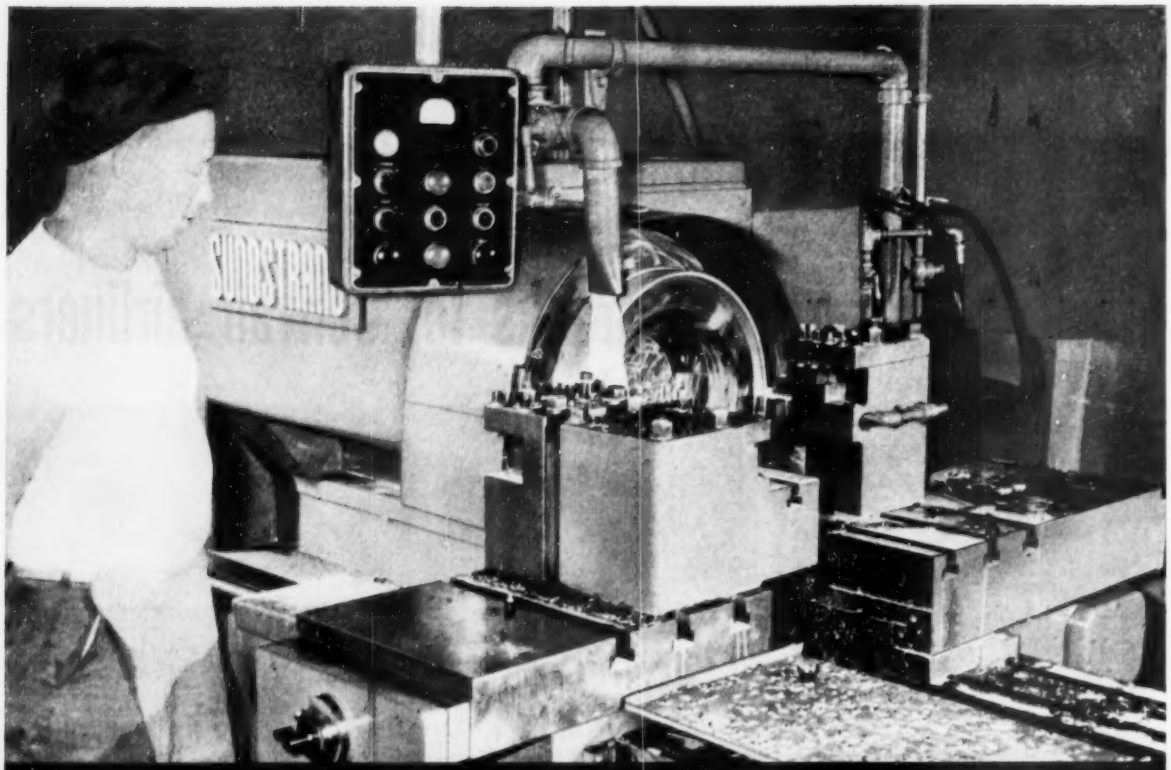
UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy USS Steels

ELECTRIC FURNACE OR OPEN HEARTH · COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

3-843

UNITED STATES STEEL



Kaydon Reduces Turning

With a Sundstrand Automatic Lathe

This is only one example of how the Kaydon Engineering Corporation of Muskegon, Michigan uses this Sundstrand Model 16 Automatic Lathe in production runs of special bearings.

On one particular lot of 112 outer races 16" outside diameter, the time was cut over 50% including setup time.

Among the many parts run on this Sundstrand Automatic Lathe are inner and outer bearing races for straight roller bearings, taper roller bearings and spherical roller bearings, sizes ranging from 9½" to 23⅜" outside diameter.

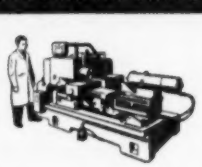
Boring, facing, turning, forming roller paths and ball paths, radii, chamfering and cutoff are the operations performed.

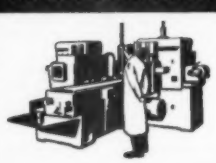
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

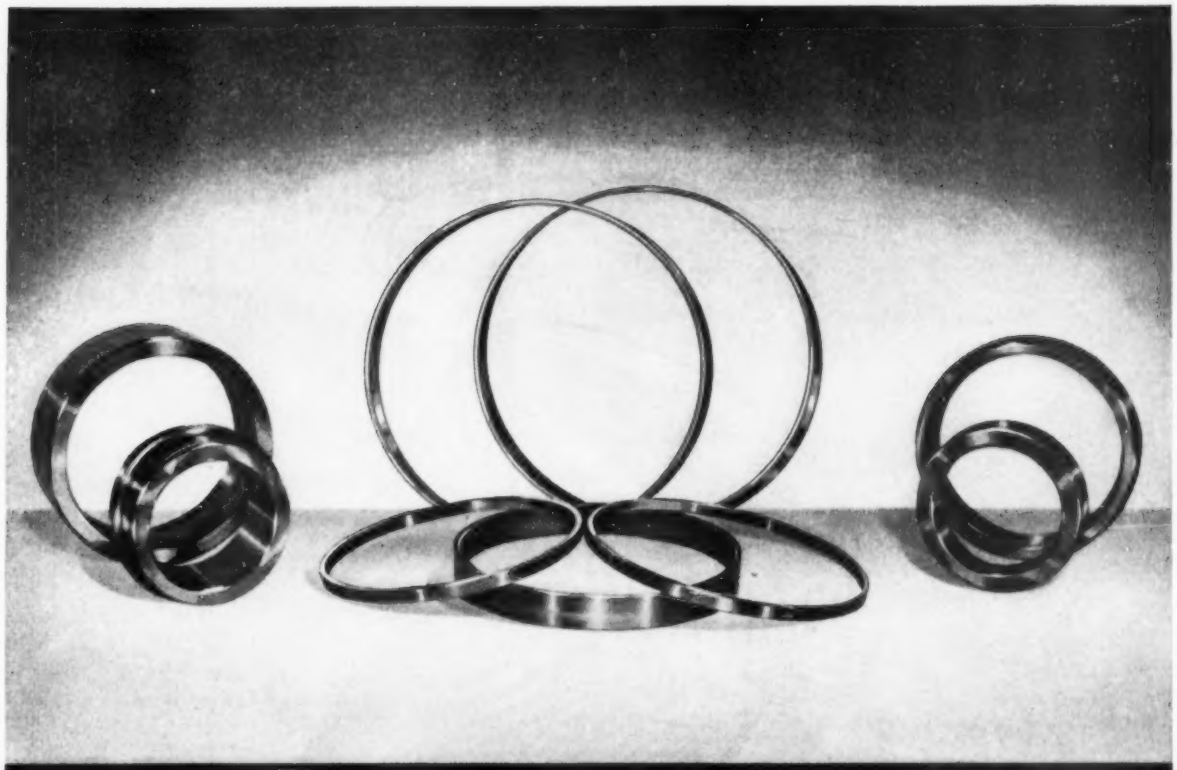
SUNDSTRAND

"Engineered Production" Service*

*REG. U.S. PAT. OFF.







Time Over 50%....

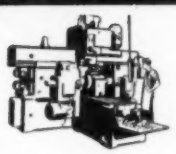
Lot Sizes Vary From 100 to 1000 Pieces

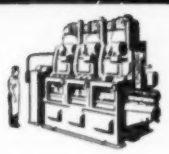
On the various lots run, the production increase averages nearly 3 times the former method. There are many important features of Sundstrand Automatic Lathes that make them outstanding producers on both long run and small lots. For instance, complete control of all cycles is provided by adjustment of dogs on a disc. Making cams is eliminated. Changing position of dogs on the disc changes length of rapid approach, feed and rapid return stroke enables operator to set up cycle quickly and change over from one job to another with ease. Get the facts now. Write for the booklets offered below or call in a Sundstrand engineer. There is no obligation for this service.

Free Data

You'll find information on the complete line of Sundstrand Automatic Lathes in these 5 folders. Write for your copies today. Ask for bulletins 137.

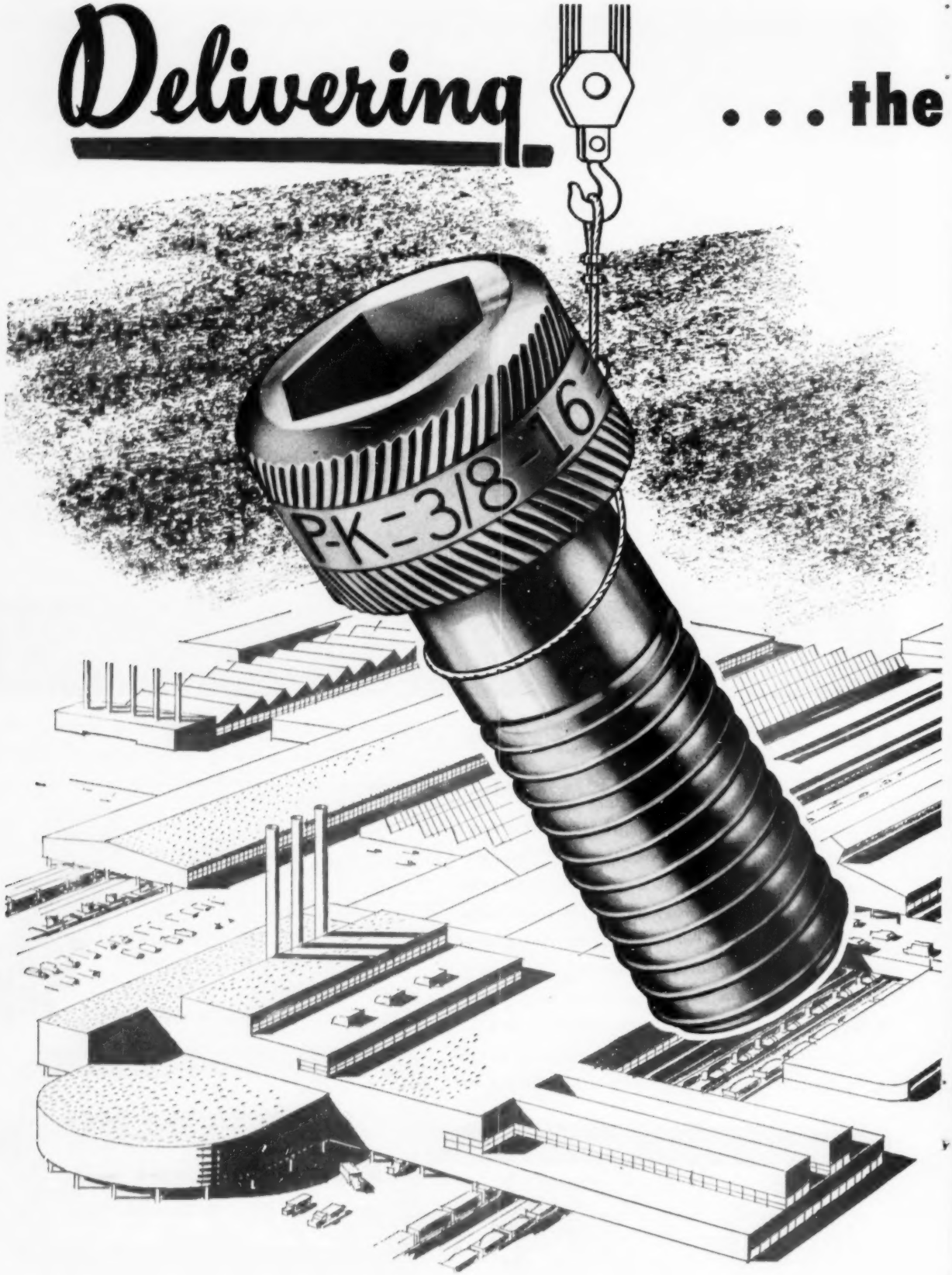
TRIPLEX RIGIDMILS | SPECIAL MACHINES



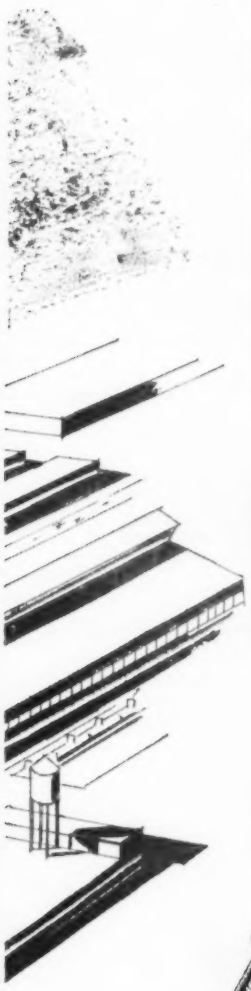


SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

Delivering . . . the



fastener ideas of the future



Back in 1942, the Size-Mark on Socket Cap Screws was considered a visionary idea, attainable only in the distant future, by most fastener authorities. Ground Threads on Socket Set Screws were thought another of such "dream" developments.

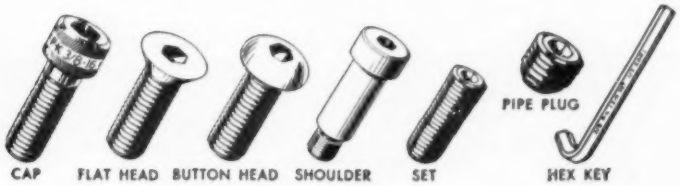
But Parker-Kalon licked the problems, *delivered* both improvements *within the year,* on P-K Socket Screws.

Originator of so many of the fasteners essential to modern assembly methods, Parker-Kalon has always preserved the pioneering spirit. You can continue to look to P-K for the fastener ideas of the future, *delivered today.*

Get samples of P-K Socket Screws . . . and compare. See why they'll put your product a step ahead . . . assembly-wise and sales-wise.

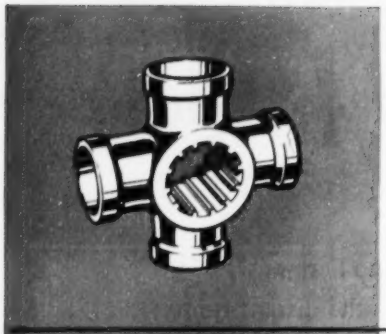
PARKER-KALON®
SOCKET SCREWS

The *only* Size-marked Socket Cap Screws
The *first* Ground Thread Socket Set Screws



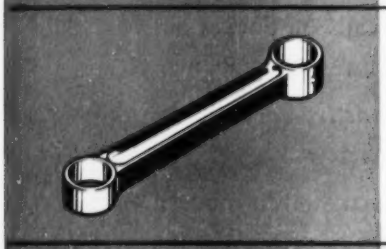
SOCKET SCREW DIMENSION FINDER
Helps you plan assemblies. Pocket size plastic slide chart gives essential dimensions of all types of P-K Socket Screws. For a free Dimension Finder, Socket Screw samples, or other data, see your P-K Distributor. Or write: Parker-Kalon Corporation, 200 Varick Street, New York 14.

The INDUSTRIAL DISTRIBUTOR steers your supply dollars to the best values.



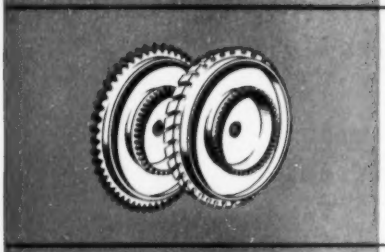
DETROIT BROACH TOOLS PROPELLER HUBS

Detroit Broach tooling for aircraft engine parts began with reciprocal engine designs. A typical example was the Detroit Broach tooling to produce the spline inside propeller hubs. In one pass, broaching produced a complete spline with consistent accuracy. This led to more accurate spline broaching in many other fields, too.



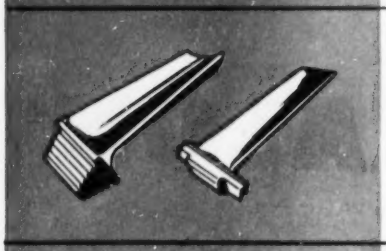
DETROIT BROACH TOOLS ARTICULATING RODS

As radial engines came to the forefront, new challenges in precision tooling were met by Detroit Broach ingenuity. Typical of reciprocal engine parts broached were articulating rods. Detroit Broach tooling produced a better finish and greater accuracy on the machined surfaces of these parts.



DETROIT BROACH TOOLS TURBINE AND COMPRESSOR WHEELS

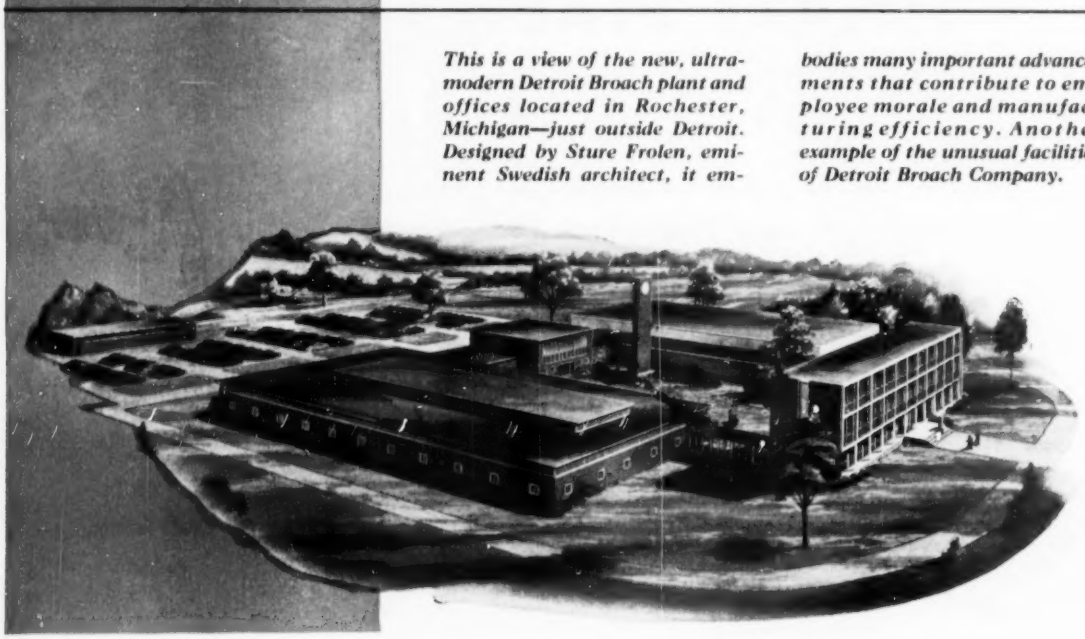
With the advent of jet engines, the need for close-tolerance repetitive accuracy was even more acute. In addition came the problem of working with high-alloy, heat-resistant, tough-machining metals. Compressor and turbine wheels are typical of the parts for which Detroit Broach tooling is meeting all requirements with flying colors. Varied forms of slots are produced in these wheels, square, at helix and at conical angles to the axis.



DETROIT BROACH TOOLS TURBINE AND COMPRESSOR BLADES

Mating parts to compressor and turbine wheels, the compressor and turbine blades are two more parts on which Detroit Broach tooling turned the trick. Intricate "Christmas Tree" forms, dovetail and "Ball Root" forms are easily produced with accuracy. At the same time, production costs are rock-bottom and surface finishes generally need no further machining.

This is a view of the new, ultra-modern Detroit Broach plant and offices located in Rochester, Michigan—just outside Detroit. Designed by Sture Frolen, eminent Swedish architect, it embodies many important advancements that contribute to employee morale and manufacturing efficiency. Another example of the unusual facilities of Detroit Broach Company.



Broaching Pioneers

IN THE AIRCRAFT INDUSTRY

Since the price of poor fits on engine parts may be paid in human lives, the aircraft industry was quick to recognize and adopt the inherent accuracies of broaching.

It was quick, too, to recognize the ability of Detroit Broach to engineer and produce tooling that met the need for concise repetitive accuracy . . . tooling with important production economies as shown on the opposite page.

in YOUR industry, too you will find many examples of Detroit Broach tooling that is producing repetitive accuracy, part after part after part. Just as important, it is tooling that consistently makes good common sense in terms of efficient operation and rock-bottom cost-per-piece broached.

These benefits that accrue Detroit Broach customers are not achieved by magic or by gift. They are the result of years of specialization in one important field . . . broaching. Every person, every machine, even plant facilities at Detroit Broach are geared to that single purpose.

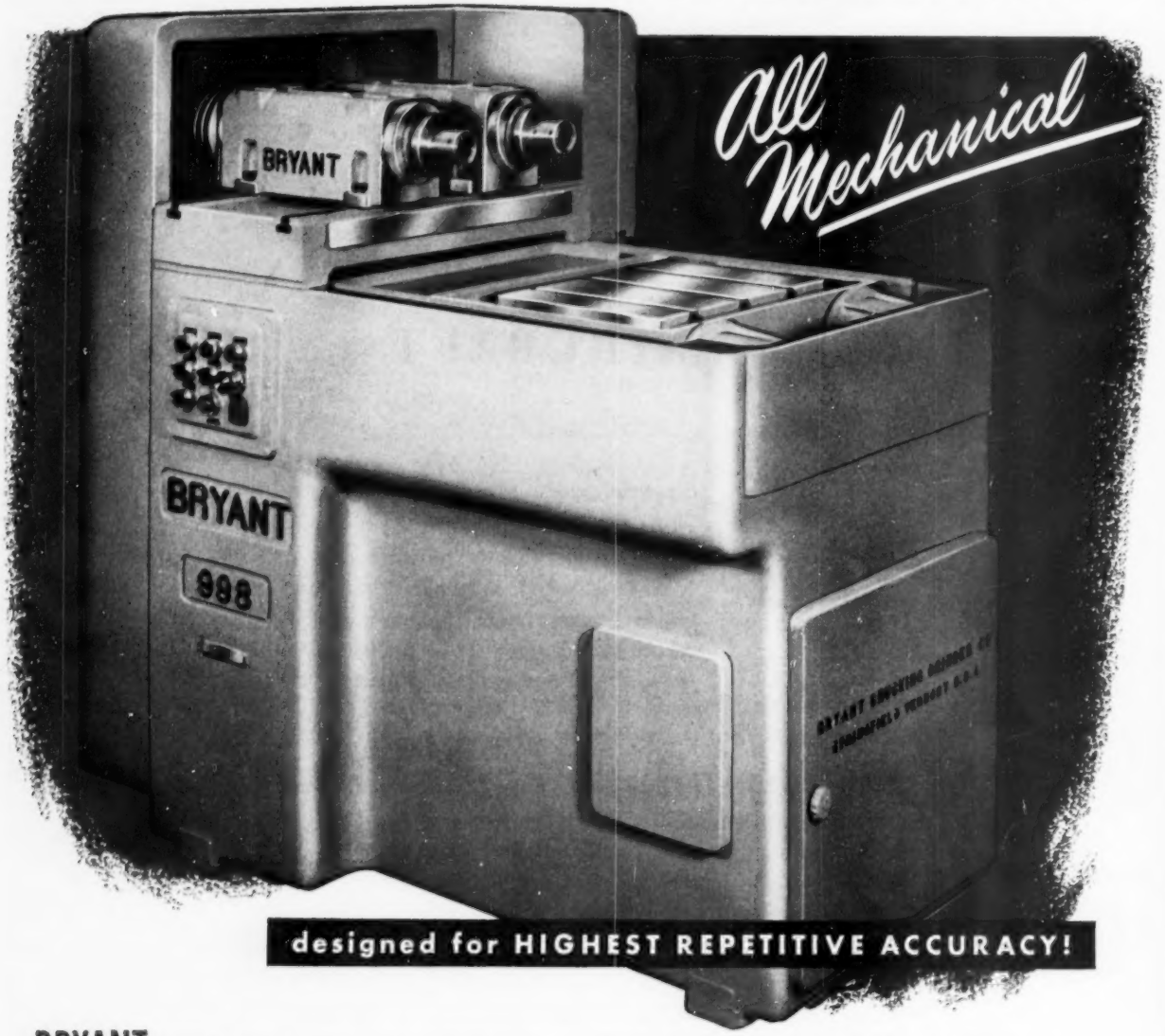
In broaching it will pay you, too, to have a talk with Detroit Broach Company . . . pioneers in broaching yesterday, today, and tomorrow.

Detroit Broach COMPANY

ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

ANNOUNCING the new BRYANT



BRYANT proudly introduces the newest member of the Bryant family of precision machines — the Bryant 998 Boring Machine — a production machine for precision boring, drilling, turning, facing, grooving and contour turning and boring where fine finish and rapid production are desired.

The Bryant 998 can be tooled either as a single purpose machine for quantity production or for miscellaneous work on small lots. Because it is all-mechanical, its cycle is positive and constant.

Smooth, uniform motion of the table and freedom from vibration, so essential to generating a fine finish with a single point tool, are assured by the 998. Its bed, bridge, heads and table are Meehanite castings. The table moves on preloaded ball bearing slide bars and is mechanically actuated by a simple cam and lever unit. Cam and change gears are easily accessible for changing either the length of stroke or the rate of travel. The motors for driving the cam and the boring heads are mounted in an accessible cavity inside the bed, thus keeping floor space to a minimum. This cavity is fan ventilated.

Ample fixture mounting surface is provided by the table, which measures 17½" x 22". The table has three ½" T-slots, and will accommodate a wide variety of fixtures. Machined setup pads are provided on the bridge for ease in locating fixtures.

The design of the Bryant 998 takes full advantage of standard purchased parts. Brakes, motors, air cylinder, bearings, pneumatic follower system, lubrication hoses and all electrical apparatus are stock items. Either low or high pressure coolant systems are available. All electrical equipment conforms to J. I. C. standards.

BORING MACHINE

Design

- The bed, bridge, table and heads are normalized Meehanite castings.
- The cam actuated table moves on preloaded ball slide bars.
- The cam is hardened and ground.
- The boring head spindles rotate in preloaded super-precision ball bearings. A graduated spindle nose and eccentric bushing for tool setting are standard.
- An air cylinder opposes the work table motion directly with constant pressure and keeps the cam follower roll and the cam always in contact.
- The boring head drive is completely accessible and is designed for long life.
- The cam drive assembly is protected by a torque limiting clutch.
- Cycle time is controlled by precision change gears in the cam drive gear box.
- An ample pad is provided at the rear of the machine for mounting accessory equipment.

Operation

- Push button controls are conveniently located on a panel at the front of the machine.
- Cycle can be manual, semi-automatic or fully automatic.
- An emergency stop button will instantaneously interrupt the cycle.
- Jog buttons are located on both the front and the rear of the machine for setup purposes.
- Machined setup pads are provided on the bridge for ease in locating fixtures.

Maintenance

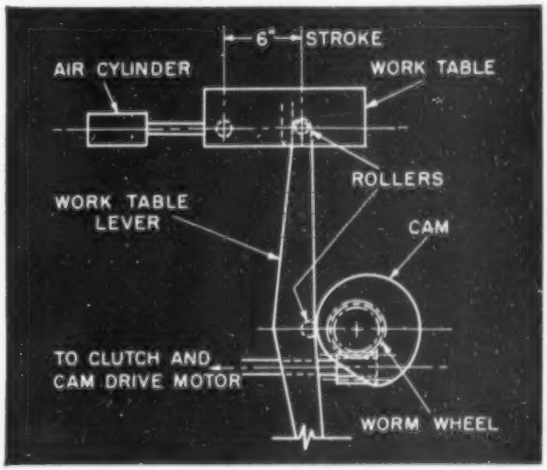
- Maintenance is necessary at only three points: two grease fittings on the cam follower assembly and cleaning and lubricating of the filter-lubricator unit in the pneumatic system.
- The ball slide table is grease sealed.
- Gear box has its own closed lubrication system.
- The boring head bearings are permanently grease sealed.
- The cam is easily accessible for changing the table stroke. It is taper mounted and keyed to the drive shaft to ensure ease of changing and accurate mounting.
- The change gears are enclosed in their own wet sump, splash lubrication system.
- Brakes, motors, air cylinder, bearings, pneumatic follower system, lubrication hoses and all electrical apparatus are standard purchased parts.

Write today for complete information and specifications!

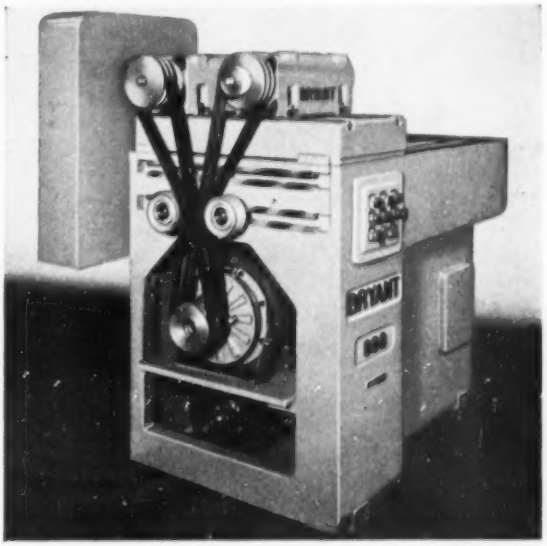
BRYANT Chucking Grinder Company
Springfield, Vermont, U. S. A.

Internal Grinders, Internal & External Thread Gages, Granite Surface Plates, Boring Machines

Smooth response of the table is ensured by the special Bryant slide bar design. Each bearing is a hardened steel sleeve containing numerous ¾" diameter preloaded balls. This provides a metal-to-metal contact which resists forces in all directions and transmits stresses directly to the bed.



The table is actuated by an inexpensive, quick-change cam working through a follower and lever arm. An air cylinder opposes the work table motion, keeping the cam follower and the cam always in contact to completely eliminate back-lash and jump.



Cam drive and boring head motors are mounted in a well ventilated cavity in the bed.

AUTOMATION STARTS WITH WESTINGHOUSE MOTORS AND CONTROLS

How to match motors and controls to production machine capacity

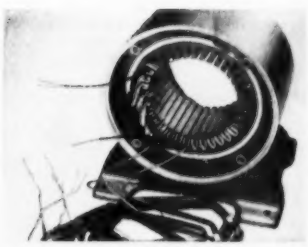
Figure the cost of down time for this gang drill press and you have another reason why thousands of users depend on the reliability of Life-Line* motors and controls. Compare these modern standards set by Westinghouse Motor and Control design:

Take Life-Line motors for example: heavy steel gives added strength yet lighter weight for increased torque per pound. Pre-lubricated bearings do away with greasing. Continuous wound stator coils are dipped and baked in special Tufvar® insulation varnish, for thorough protection against dirt and grease. In addition, the Life-Line motor is actually 33% smaller overall, than similar horsepower motors. It takes up less space on production machinery . . . can be located in cramped quarters.

*Trade Mark

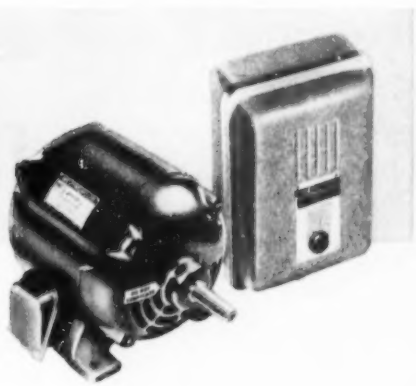
For maximum service, Life-Line starter design reduces the number of moving parts. The overload relay operates with snap action by means of a special bimetallic disc developed by Westinghouse. The clapper-type contactor is seesaw balanced on a knife-edge bearing. This means there are no sliding members . . . nothing to stick or jam. Most important, the exclusive "De-ion®" arc quencher more than doubles the life of the contacts.

Your local Westinghouse representative will gladly give you a Life-Line 101 Case History booklet, B-4769-A. You can see these facts as they are presented in the movie *Life-Line Speaks for Itself.* Ask, too, for Westinghouse Control Booklets B-5882 and B-6051; or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21752



Continuous wound coil groups assure positive current flow through windings . . . reduce the number of connections between coils.

"De-ion" arc quencher confines, divides and extinguishes hot arcs in a half cycle or less; greatly increases contact life.



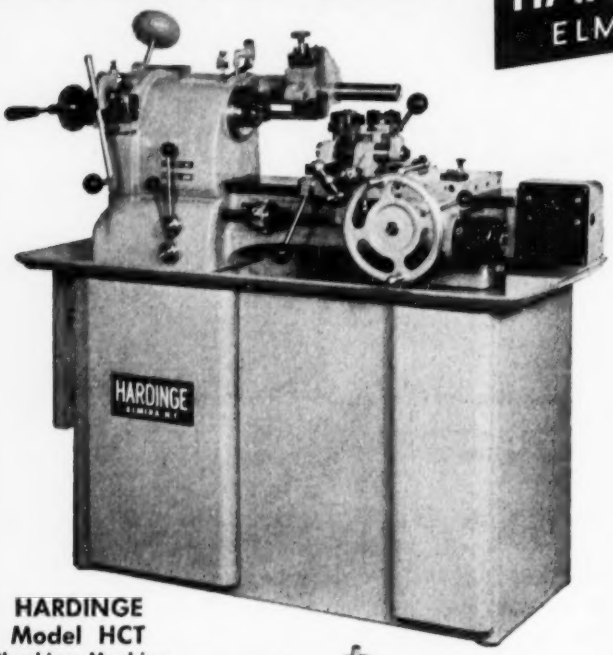
YOU CAN BE **SURE**...IF IT'S

Westinghouse

Precision PRODUCTION MACHINES

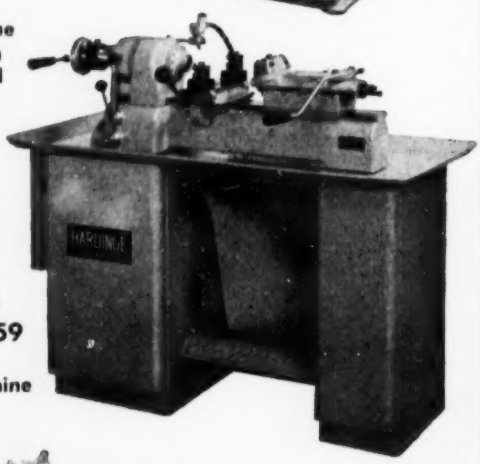
HARDINGE
ELMIRA, N.Y.

Precision TOOL ROOM MACHINES

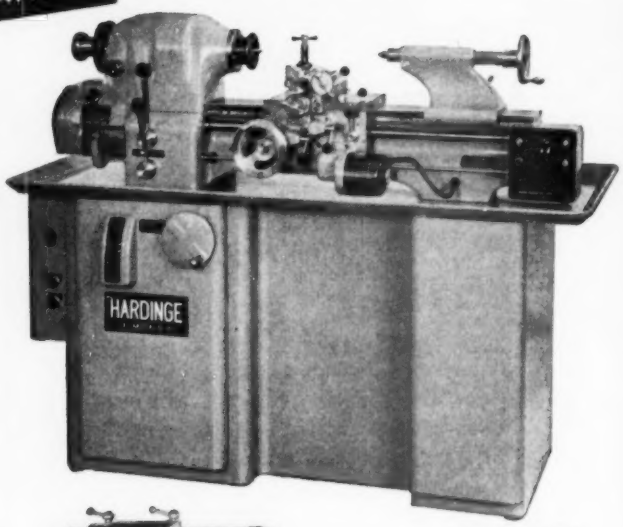


HARDINGE
Model HCT
Chucking Machine with Production Threading Head

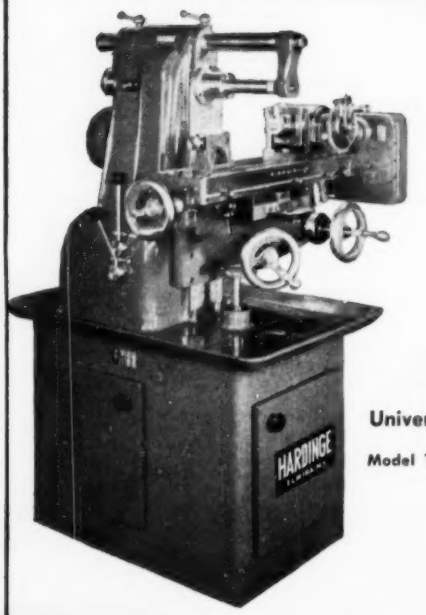
Also Model HC Chucking Machine without Production Threading Head



HARDINGE
Model DSM 59
Second Operation Machine



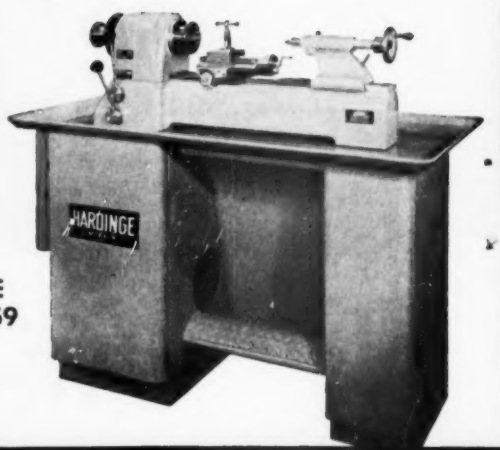
HARDINGE
Model HLV
Tool Room Lathe



HARDINGE
Model UM
Universal Milling Machine
Also
Model TM Plain Milling Machine

HARDINGE
Model VBS
Second Operation Machine with Stationary Collet

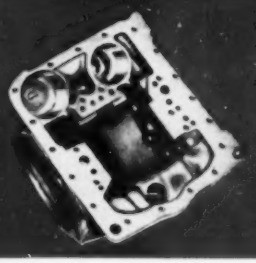
ALL MACHINES
Feature
HARDINGE Preloaded Ball Bearing Spindle Construction for High Speeds



HARDINGE
Model DV 59
Lathe

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

TRANSMISSION CASE (CAST IRON) THREE TYPE I, ONE TYPE III SURFACES



PUMP GEARS (CAST IRON; STEEL) SIDE SURFACES, TYPE IV

TRANSMISSION COVER AND GOVERNOR BODY (BOTH ALUMINUM) TYPE III SURFACES

PINION GEARS (HARDENED STEEL) THREE TYPE II, TWO TYPE IV SURFACES

FOR PRECISION FINISHING OF FUNCTIONAL SURFACES

PowerFlite transmission parts are *Microhoned*

Chrysler engineers, with years of proficiency in production-processing of precision parts, have specified the Microhoning process as the method for obtaining

✶ DIMENSIONAL ACCURACY ✶ GEOMETRIC PRECISION ✶ CONTROLLED SURFACE FINISH

required for the efficient functioning of the new PowerFlite transmission.

FOUR TYPES OF SURFACES IN THE *PowerFlite* ARE MICROHONED:

Type I—Cylindrical surfaces through which a piston or valve moves.

These surfaces must be round, straight and accurately sized, with a controlled surface finish—in order to minimize wear and eliminate oil leakage. The Microhoned finish assures non-flaking surfaces between the stationary and moving parts.

Type II—Cylindrical surfaces in rotating parts.

Microhoning maintains concentricity of pitch diameter of teeth and the bore of gears, permitting teeth to mesh with minimum noise and wear. The bore must have precise geometry, size, and functional finish to retain a lubricating film at high speed.

Type III—Flat surfaces that are bolted together without a gasket.

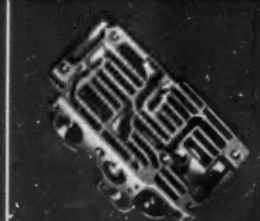
They must be flat enough so that they will not distort when pulled together, and must have a surface finish that will mate to form a tight, effective seal.

Type IV—Flat surfaces that move in contact with stationary surfaces.

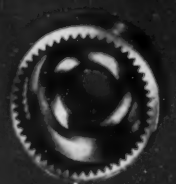
These must be smooth and flat in order to minimize friction and wear, and maintain a "running seal", thus eliminating leakage.

For more information on the Microhoning process write to:
Field Engineering B7
Micromatic Hone Corporation
8100 Schoolcraft Avenue
Detroit 38, Michigan

VALVE BODY (ALUMINUM) TWO TYPE III, ONE TYPE I SURFACES



KICK-DOWN GEARS (STEEL) TYPE IV SURFACES



TRANSFER PLATE AND REGULATOR BODY (BOTH STEEL) TYPE III SURFACES

MICROHONING MACHINES • TOOLS • FIXTURES • ABRASIVES

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614 Empire Building
206 So. Main Street
Rockford, Illinois

MICROMATIC HONE CORP.
1535 Grande Vista Avenue
Los Angeles 23, California

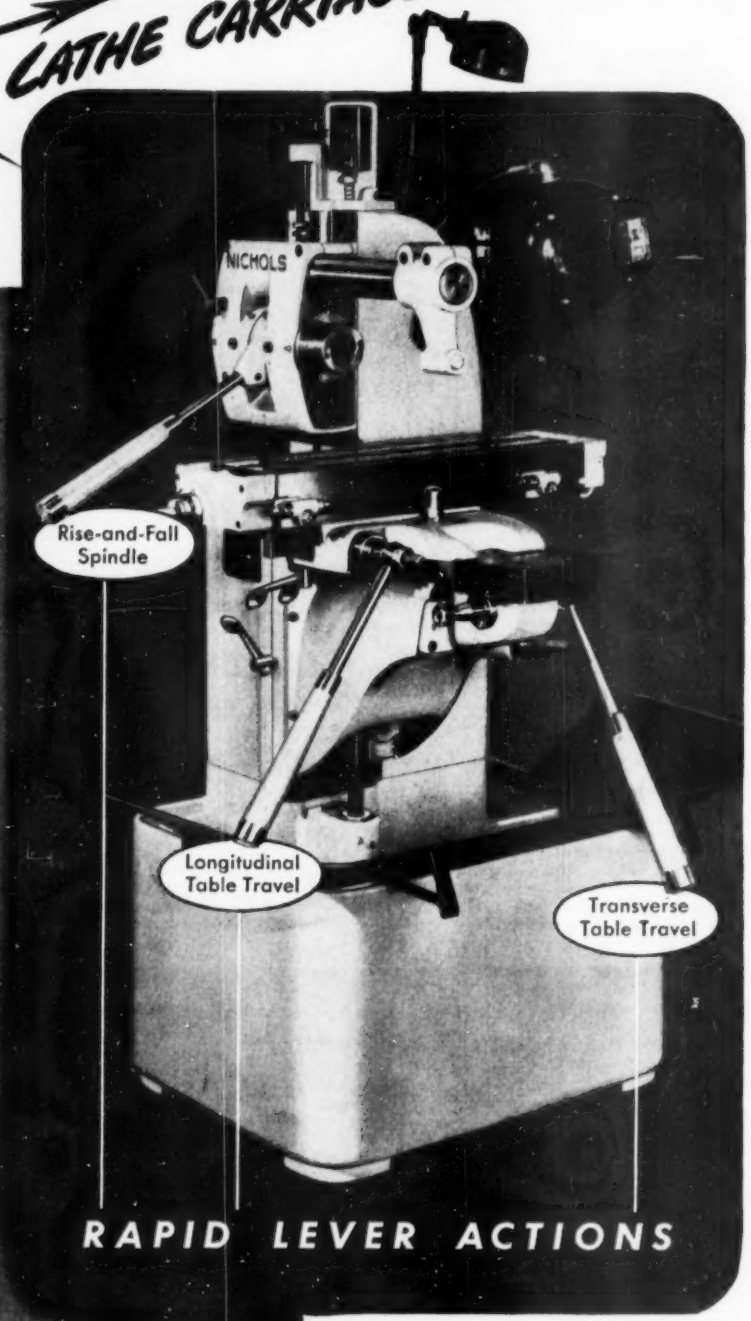
MICROMATIC HONE LTD.
330 Grand River Avenue
Brantford, Ontario, Canada

MICROMATIC HONE CORP
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

REPRESENTATIVES:

Overgard Machine Tool Company, 234 Commonwealth Bldg., Denver 2, Colorado • Allied Northwest Machine Tool Corp., 103 S. W. Front Ave., Portland 4, Oregon
REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

LATHE CARRIAGE FLEXIBILITY



Nichols Miller

PRODUCTION MODEL

Precision turning, boring and recessing jobs that are normally assigned to toolmaker's lathes or expensive boring machines, come natural to the versatile NICHOLS Millers.

Rapid Lever Actions on the Spindle Head, Table, and Saddle provide unparalleled flexibility of movements. The Lever Transverse Feed, an exclusive NICHOLS development, is especially valuable. Makes NICHOLS different from other hand millers. It adds *"lathe-carriage flexibility"* to your most intricate machining operations, while maintaining tolerances to "tenths." Work can be chucked lathe-fashion on the spindle with tools mounted on the table or vice versa.

Adjustable positive stops, quick-acting locks on sliding movements, and the highest degree of precision are standard equipment.

"THE MILLER THAT USES ITS HEAD"

Send for free illustrated brochure.

RAPID LEVER ACTIONS

MANUFACTURED BY W. H. NICHOLS COMPANY, WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS

NICHOLS-MORRIS CORPORATION

76-F Mamaroneck Ave., White Plains, N. Y.

CONDENSED SPECIFICATIONS

Table Working Surface	6¾" x 21"
Longitudinal Table Travel	10"
Transverse Table Travel	7"
Vertical Travel of Knee	13"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to	5000 R.P.M.
Weight	1250 lbs.

Motor Repair Service Wherever You Are

"Certified"

Factory approved motor service in every industrial area from 101 Allis-Chalmers Certified Service Shops.

ALABAMA
Birmingham—Elec. Repair & Serv. Co.
Greenville—Mowbray Eng. Co.
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San Diego—Calif. Elec. Works
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Oakland—Pacific Elec. Motor Co.
T. L. Rosenberg Co.
San Francisco—Weidenthal-Gostiner Electric Works

COLORADO
Denver—Baker Electric Company

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Hartford—Charles H. Leppert
Waterbury—Elec. Motor Repair Co., Inc.

FLORIDA
Jacksonville—Turner Electric Works
Miami—Peninsular Armature Works
Tampa—Tampa Armature Works, Inc.

GEORGIA
Albany—Georgia Electric Co.
Atlanta—Bearden-Thompson Elec. Co.
Columbus—Smith-Gray Electric Co.

ILLINOIS
Chicago—Chicago Electric Co.
Marion—Giles Arm. & Elec. Wks., Inc.
Mt. Vernon—Dowzer Electric Machinery Works, Inc.

INDIANA
Indianapolis—Scherer Electric Co., Inc.
Evansville—Evansville Elec. & Mfg. Co.

IOWA
Sioux City—Smith Elec. & Supply Co.

KANSAS
Salina—Cent. Kans. Elec. Mach. Co.
Wichita—Tarrant Electric Mach. Co.

LOUISIANA
New Orleans—Industrial Elec., Inc.
Shreveport—Shreveport Armature & Electric Works

MAINE
Brewer—Stanley J. Leen Co.

MARYLAND
Baltimore—Keystone Electric Co., Inc.

MASSACHUSETTS
Lawrence—Roland B. Glines Co.
Springfield—Elec. Motor Repair Co.

MICHIGAN
Detroit—Stecker Electric Company
Grand-Rapids—Grand Rapids Industrial Electric Co.
Saginaw—Banning Elect. Prod. Corp.

MINNESOTA
Duluth—Mielke Electric Works, Inc.
Minneapolis—Parsons Elec. Co.

MISSISSIPPI
Vicksburg—Ludke Electric Co., Inc.

MISSOURI
Kansas City—Boese-Hilburn Elec. Co.
St. Louis—French-Gerleman Elec. Co.
Springfield—Springfield Elec. Serv. Co.

NEBRASKA
Omaha—Omaha Electrical Works

NEW HAMPSHIRE
Concord—A. S. Tracy

NEW JERSEY
Atlantic City—Charles A. Buckley
Paterson—Elec. Service Repair Co.
Trenton—Lockwood Elec. Motor Serv.

NEW MEXICO
Albuquerque—Electric Motor Company
Powell Electric Co.

NEW YORK
Buffalo—Robertson Electric Co.
Volland Elec. Equip. Co., Inc.
Flushing—Flushing Elec. Corp.
Jamestown—A. E. Westburgh
Mt. Vernon—H. A. Schreck, Inc.
New York—Consol. Elec. Motor Co.
Rochester—Vanderlinde Elec. Corp.
Utica—Mather, Evans & Diehl Co.
Watertown—Watertown Elec., Inc.

NORTH CAROLINA
Charlotte—Southern Elec. Service Co.
Greensboro—Southern Elec. Serv. Co.
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OHIO
Cincinnati—Cincinnati Elec. Equip. Electric Service Co.
Akron—A-C Supply Co.
Toledo—Romanoff Elec. Motor Serv.
Youngstown—Winkle Electric Co.

OKLAHOMA
Miami—Miami Armature Works
Oklahoma City—Southwest Elec. Co.
Tulsa—Smith-Milligan Electric Co.

OREGON
Eugene—Kalen Electric & Mach. Co.
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PENNSYLVANIA
Johnstown—Universal Elec. Mfg. Co.
Osceola Mills—Mid-State Elec. Eng. Co.
Philadelphia—Elec. App. & Repair Co.
Pittsburgh—Penn. Elec. Coil Corp.
York—Industrial Electric Company

SOUTH CAROLINA
Greenville—Southern Elec. Serv. Co.
Spartanburg—Southern Elec. Serv. Co.

SOUTH DAKOTA
Sioux Falls—Electric Motor Repair

TENNESSEE
Columbia—Middle Tenn. Arm. Wks.
LaFollette—Standard Arm. Works, Inc.
Memphis—Indus. Elec. & Supply Co.

TEXAS
Amarillo—G. E. Jones Elec. Co.
Beaumont—Elec. Mach. & Repair Co.
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El Paso—B & M Machinery Co.
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UTAH
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VIRGINIA
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Charleston—Charleston Elec. Supply
Fairmont—West Virginia Armature Co. of Fairmont, Inc.
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CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

***TEXROPE* — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.**

PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

9-Stage progressive dies are used to blank, form, pierce and trim. Feeding and scrap cutting (scrap delivered to tub at side of press) is fully automatic. Piece parts are blown by air up rear delivery chute and onto conveyor for delivery.

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HYDRAULIC METALWORKING EQUIPMENT

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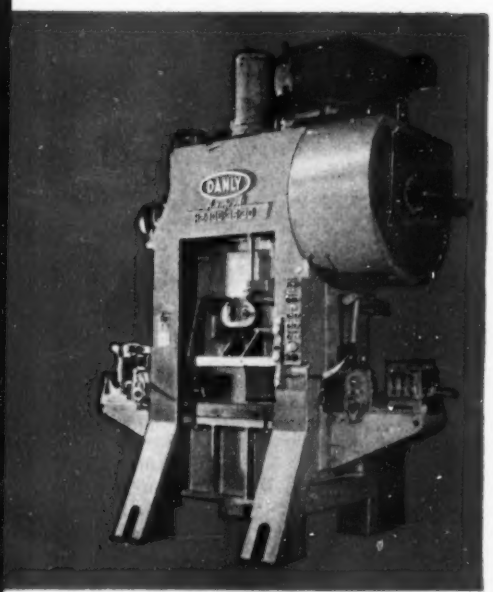
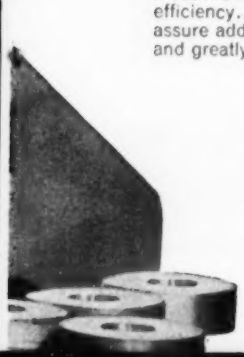
high operating efficiency

on high production jobs?



Longer die life . . . continuous high-speed operation of the Danly Autofeed Press makes the die investment pay off in production efficiency... precision press features assure added alignment accuracy and greatly lengthened die life.



A Leading Automotive Parts Manufacturer DID IT on their

DANLY PRESS

Selecting the right press for an intricate die set-up was a difficult problem facing a leading producer of automotive parts. Needed was a *high production* press built for rigidity and precision to extend the life of costly 9-stage progressive dies and improve piece part quality.

What press was specified? A Danly 100-ton Autofeed Press *more than met every requirement* with a remarkably high record of *operating efficiency!* Running full automatic almost continuously through 2 shifts daily, this Danly stamps automobile thermostat valve seats at a rate of 125 strokes per minute. Since installation no major maintenance has been required ...cutting "down-time" losses, permitting steady, uninterrupted production.

Danly Presses have solved this problem for leading stamping shops across the country . . . and can do the same for *you*. Write for free Danly Autofeed Press Booklet and get the details.

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2100 South Laramie Avenue, Chicago 50, Illinois

PROVED AGAIN... *It costs less to run a DANLY PRESS!*

Single Action Straight Side

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Underdrive Single, Double, Triple Action

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Quality TOOLS

NOT A COST, BUT AN INVESTMENT

That Pays Year After Year . . .

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's jobs and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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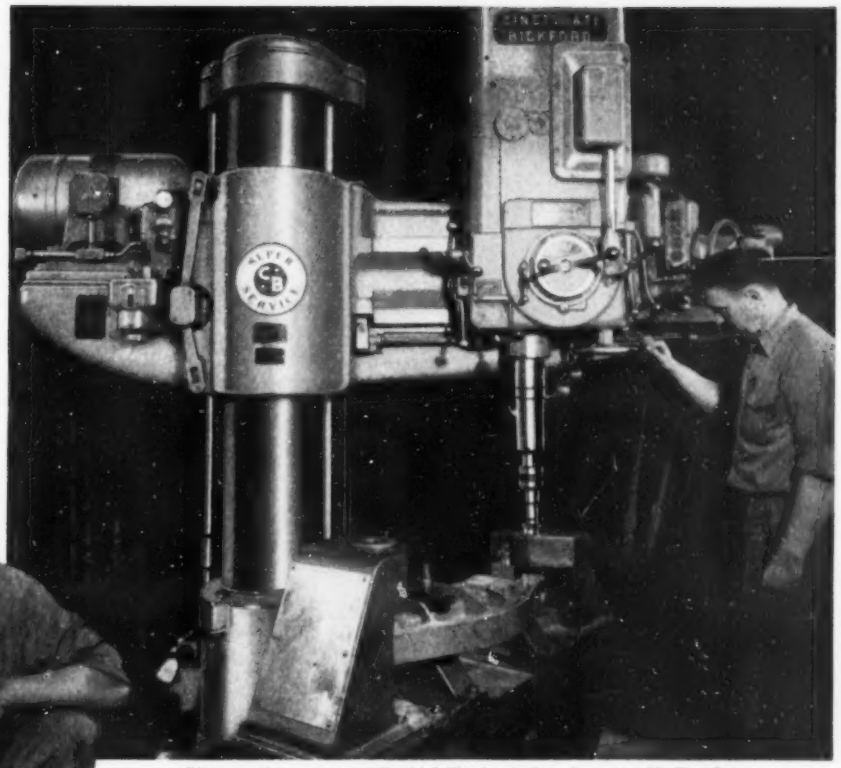

Main lever of 24" Industrial Shaper. Gould & Eberhardt, Inc., Irvington 11, New Jersey.

Photographs courtesy of Gould & Eberhardt, Inc., Irvington 11, New Jersey.

"improved quality"

This exacting job at Gould & Eberhardt, Inc. calls for drilling, boring, reaming and facing one $2\frac{3}{16}$" hole and one $1\frac{11}{16}$" hole. Holes must be parallel with each other and square with the ways within .0015" per foot. Diameters are held to $\pm$.0003". This Cincinnati Bickford Super Service Radial Drill brought improved quality in production.

Write for catalog R-29.

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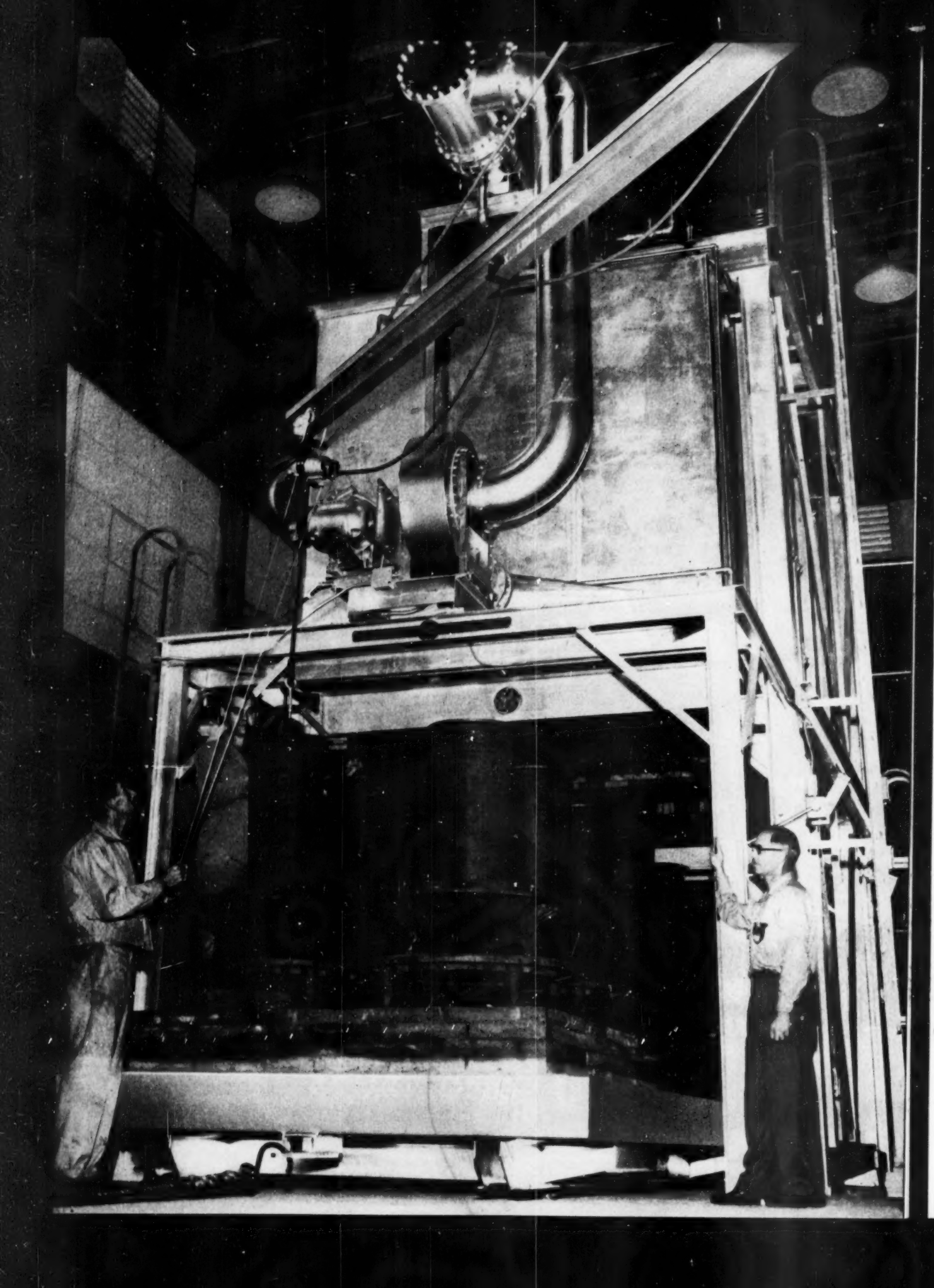
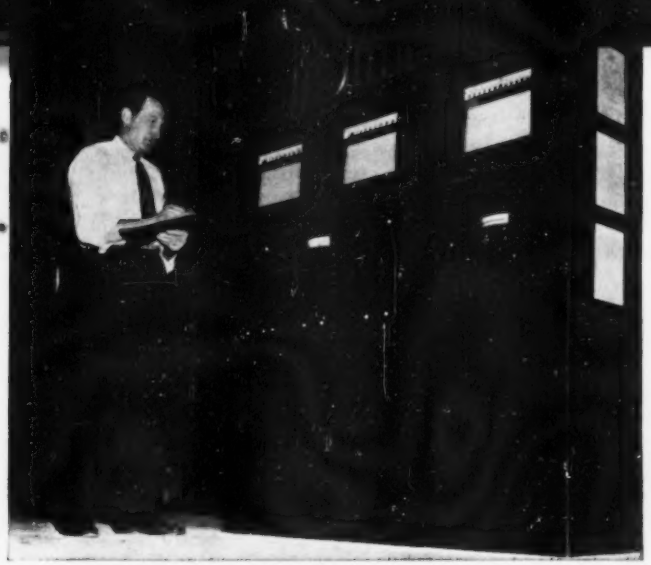
RADIAL AND UPRIGHT DRILLING MACHINES

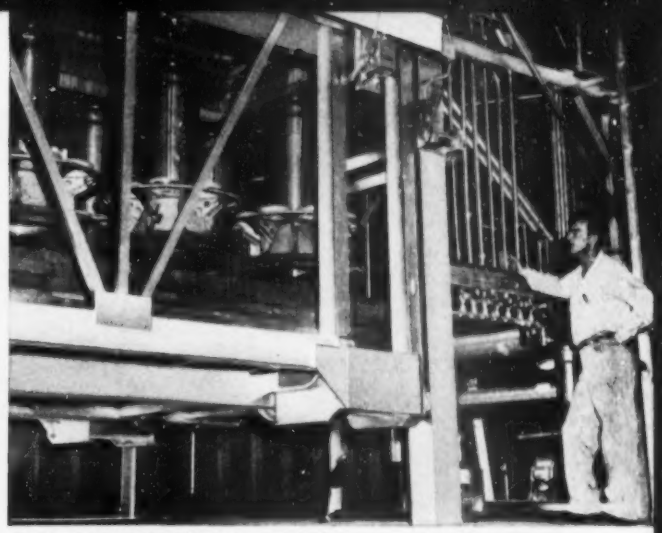
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.





PROPER CONTROL AND TIMING of the complete heating cycle is provided by the G-E heating control unit above. To assure efficient furnace operation and uniform heating of parts, the unit provides automatic programming of heating and cooling cycles.



ONLY ONE OPERATOR is required to supervise temperatures, pressures, cooling phase, and atmospheric conditions. To minimize oxidation of jet parts a G-E gas converter, right, supplies gases of varying analyses as required by the heating cycle.

Solving Ryan's complex heating problem speeds nation's jet engine production

Key to success of America's jet engine program are the subcontractors who back up the large jet engine producers. One of these subcontractors is Ryan Aeronautical Co., San Diego, Cal. In setting up their jet aft frame production, Ryan had the problem of relieving residual stresses without distorting the metal.

After studying the problem with General Electric engineers, Ryan specified a furnace that would provide uniform heating and cooling at 200 F. per hour. Fast production at low cost was also necessary.

Applying years of experience gained in the development of America's first jet engine, G.E. designed and built a special elevator furnace that allows automatic program control of the complete time temperature cycle. This assures uniform heating of each part without weakening the metallurgical structure.

STRESS RELIEVING JET AFT FRAMES in this specially designed elevator furnace is accomplished with minimum distortion of metal. Constructed to assure low-cost, high-quality heat treatment the furnace is the result of years of G-E heating research.

Fast cooling is provided by a special blower system that extracts hot air from the furnace, cools it, and then blows it back into the heating chamber. Elimination of costly reducing operations is made possible by using a G-E atmosphere converter to minimize oxidation of the aft frames. As a result Ryan receives consistently high-quality heat treatment.

Heat losses and atmosphere consumption are reduced to a minimum by a specially designed loading car that rolls under the furnace and is hoisted by electric motors to form a completely heat-sealed furnace bottom.

RYAN GETS VALUABLE INSTALLATION SUPERVISION

To assure Ryan of proper furnace operation, G-E engineers supervised the complete installation in Ryan's plant. This is standard service from G.E.'s field staff of service engineers —unmatched both in size and experience by any other heating equipment manufacturer.

This example of G.E.'s heating service is a big reason why you should contact your nearest G-E Apparatus Sales Office when selecting your heating equipment. 720-114

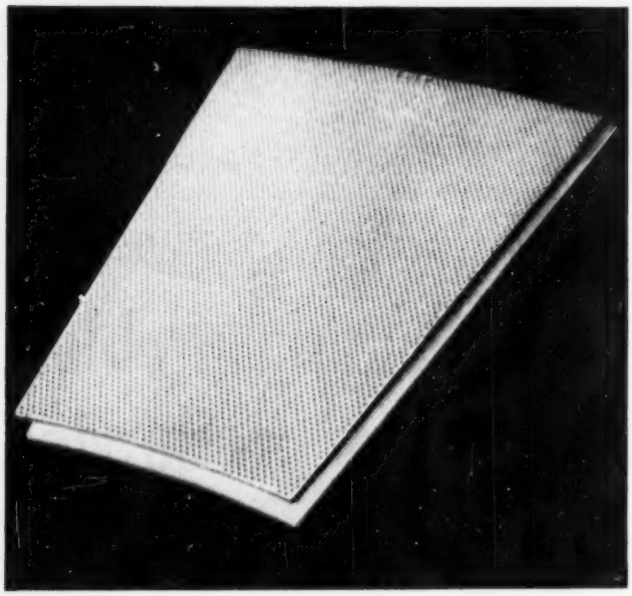
You can put your confidence in—

GENERAL ELECTRIC

Now They Are Mass Produced

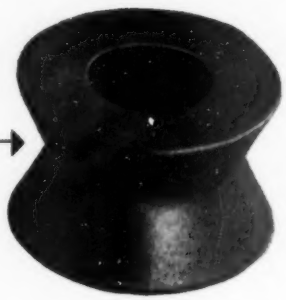
by HAYNES Investment Casting

Trade-Mark



IMPROVED DESIGN AND MATERIAL—The tiny needle-sharp points covering this plate must resist severe abrasion. Machined points used to wear out frequently because they were pyramidal in shape and highly susceptible to erosion. HAYNES investment casting made it possible to cast the points in a more stable conical shape from a hard, wear-resistant alloy. Life has been increased by 5 to 12 times.

EXCELLENT SURFACE QUALITY—For sanitary reasons, not even the smallest crevice can be tolerated on this cream separator part. Because of the high quality of HAYNES investment castings, it was found that the intricate part could be manufactured on a production basis with a minimum of imperfections showing up during the final polishing operations. This eliminated a great deal of wasted time, work, and metal.



NO MORE MACHINING—HAYNES investment casting eliminated the job of machining these rollers. Service conditions require that the rollers be made of a special alloy which is difficult to machine. They must resist rusting and the cutting action of wire passing over them under tension. The rollers give excellent service life and there are no more machining problems.

HAYNES investment castings can solve some of your own production and design problems. For more information, contact the nearest Haynes Stellite Company office listed below.

"Haynes" is a registered trade-mark of Union Carbide and Carbon Corporation.

HAYNES INVESTMENT CASTINGS

Trade-Mark

Sound, dense, high-strength parts available in cobalt-base alloys, nickel-base alloys, iron-base alloys, stainless steels, and alloy and carbon steels.

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HERE'S THE "IRON MAN" of the steel construction business!

Elmes Hydraulic Bulldozer

Shown in operation is a 200-Ton Elmes Hydraulic Bulldozer, working in the shop of one of the country's larger steel construction companies. This customer reports his Elmes Bulldozer *"has been busy without interruption since it was installed . . . has performed a tremendous amount of bending and straightening work . . . turned out a greater number of pieces than ever anticipated."*

There are sound reasons why Elmes Hydraulic Bulldozers receive such enthusiastic recommendations. They're built rugged for rugged work — heavy bending, forming, straightening. Bed and frame are of simplified, solid design, using bolted and keyed construction of structural steel. And the design is *clean*. Top of the press is clear—free from obstructions. Pumping unit is located low, at the end of the press. The press is protected. You can bring work to the press—position it quickly, from an overhead traveling crane. Head is adjustable for varying the work space opening.

Elmes Hydraulic Bulldozers are available in capacities up to 500 tons, with bed size, stroke and speed optional to suit your requirements. Your Elmes distributor can give you full details on these versatile presses and on the complete line of Elmes Hydraulic Metal-Working Presses. See him now—or write us for Bulletin No. 1010 B.

American Steel Foundries

ELMES ENGINEERING DIVISION

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KING SIZE
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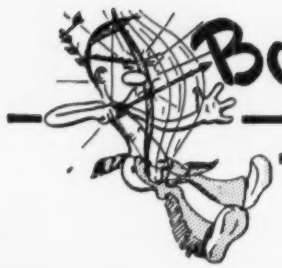

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Well Trained Assistants

Ernest W. Fair (*AM*—Sept 14 '53, p136) brings up an important part in the management planning of any industry—the training of assistants or understudies to move up when opportunity offers. This was one of Frank Gilbreth's cardinal points in his plans for management. He always tried to have an understudy ready to step into any managerial position which, of course, included foremen and all shop executives.

He preached to foremen that they could never expect promotion until they had trained someone to take their place when they moved up the line. Of course he ran into opposition from those who feared that by training a man to take their place they might be weakening their own position—the trainee might prove to be a better man than his boss. This attitude is sometimes fostered by the actions of top management in bringing in men from outside instead of trying to fill higher positions from their own personnel. But the idea that some seem to have of "bringing in new blood" can prevent the development of the best force in their own shop and be very discouraging.

As pointed out in the editorial in the issue of September 14, the personnel of even the most automatic plant is very important. Top management which ignores this is missing one of its best bets. Efficiency cannot all be obtained by even the most automatic machine equipment. Hearty cooperation, or the lack of it, by the personnel can often make or break even a modern plant with the best equipment. The right kind of personal contacts between top management and the working force, can do much to increase efficiency and the earnings of both the company and the employees, as shown by the Lincoln Electric Co.

It is not easy to establish just the right kind of contact, and it becomes more difficult as the company grows and business details take more and more of the head man's time. Much also depends on the personality of the men at the top. A few are able to secure complete cooperation while others, try as they will, do not get the same results. There is much more to it than merely mingling with the personnel and being a good fellow. Some of the best-meaning officials completely miss the mark when they try to make personal contacts, even though they try to get to the social or business level of the folks in the shop. Some can do it naturally and others can never learn.

Chester H. Franklin
New York

GRINETICS

BY D G SMITH

ALLOWANCE FOR FITS

CLUTCH PLATE

LAW OF SINES

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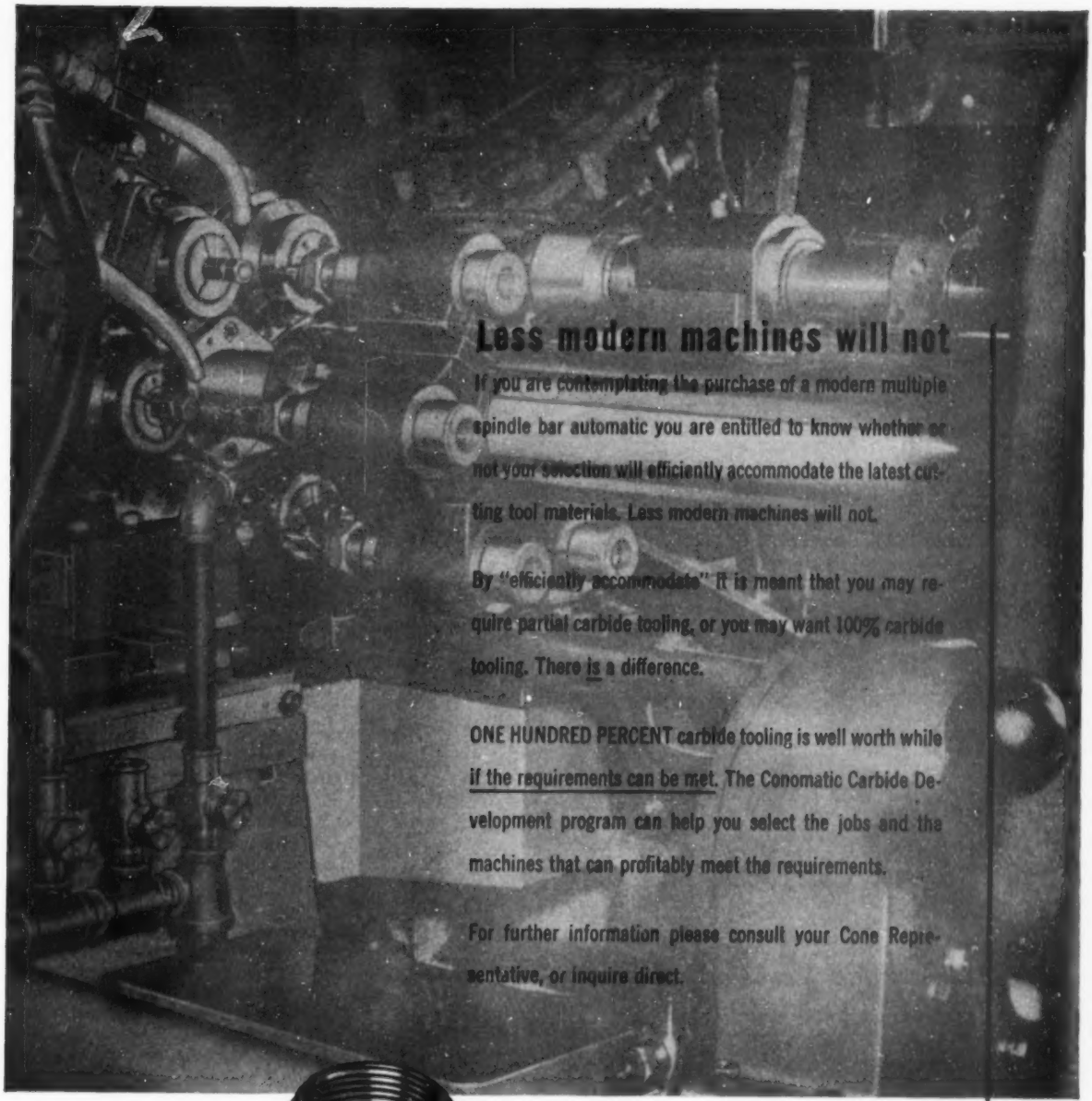


Less modern machines will not

If you are contemplating the purchase of a modern multiple spindle bar automatic you are entitled to know whether or not your selection will efficiently accommodate the latest cutting tool materials. Less modern machines will not.

By "efficiently accommodate" it is meant that you may require partial carbide tooling, or you may want 100% carbide tooling. There is a difference.

ONE HUNDRED PERCENT carbide tooling is well worth while if the requirements can be met. The Conomatic Carbide Development program can help you select the jobs and the machines that can profitably meet the requirements.

For further information please consult your Cone Representative, or inquire direct.

MATERIAL—1040 STEEL

	HSS	CARBIDE
Cycle Time	*	30 secs.
Work Spindle Speed	*	670 R.P.M. at 160 S.F.
Tool Wear	*	2000 pcs. per grind

*Hot rolled material prevents fair comparison

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

NOBLEWEST... ALWAYS AHEAD
WITH
BETTER MARKING
AT LOWER COST!

NOW...
NEW
DIAL FEED
MARKING
MACHINE

SPEED-MARKS 12,000 PIECES PER HOUR
...Automatically

Tooled for high production marking of small metal parts (12,000 pieces per hour), Model 347 illustrated above, is a good example of Noblewest's ability to keep ahead of industry's demands for constantly higher marking speeds at lower cost. Featuring a hopper and dial feed combination, parts are fed to the machine by the hopper, marked and automatically ejected. Spring pressure controls the depth of the mark and insures uniform depth of mark from piece to piece regardless of slight variations in diameter. Noblewest is equally famed for fine marking dies . . . made to the most exacting standards of quality and with the all-important skill and know-how of master craftsmen. Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job faster, better, at lower cost. For complete details write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH
NOBLEWEST Roll-O-Matic MARKING
EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

Beg Your Pardon

In an article by Ben Brosheer on mist cooling (*AM*—Sept 14 '53, p137), the final paragraph, p151, we notice the statement, "Full flushing of diamond grinding wheels is usually advocated when grinding chip breakers on carbide tools with the plunge-cut method introduced by Jan Taeysarts, of Precision Diamond Tool Co."

You may be interested to know that we, at Wickman, have advocated the plunge-cut method for chip breaker grinding with our Wickman-Neven steel-bonded diamond wheels as far back as 1947. A treatise on this was published and circulated among our customers in 1947. Around that time also, *AM* carried a news release picturing and describing this chip breaker wheel. Since that time, this company has exhibited the wheel under working conditions and mounted on a universal tool and cutter grinder grinding chip breakers by the plunge-cut method with an ample flow of coolant at every ASTE show.

Under the circumstances, we believe that we may claim to have introduced this wheel to the American market, although the method was widely used and accepted in Europe several years prior to that.

H Mandel
President
Wickman Mfg. Co, Detroit

Don't Chop Up Your Trainees

The article by Harold D Rhodenbaugh (*AM*—Aug 17 '53, p111) is very timely, both economically and from the humanitarian point of view. In these days when men and women with very little mechanical background become machine operators, it is not good business to turn them loose on machines without enough training to make them a little familiar with the various operations they will perform.

I recall being sent to perform the now obsolete operation of taking in-

dictor cards from a steam engine to find why it was not giving the guaranteed economy in steam consumption. I had read about indicators and how they worked, how to attach them to the engine and connect indicator drum so as to give the right motion, and to take the cards, but I had never seen it done.

Fortunately I knew the theory, and the engineer in charge was a good-natured guy who could see that I was green, but who made no derogatory comments while I struggled to get the indicator hooked up and take the cards. I took several diagrams which enabled us to make the necessary changes in the valve mechanism to secure the guaranteed economy, which meant getting our final payment. It would have saved time and money, plus mental anxiety on my part, if I had been shown how to do the job in our own engine room.

Many of the training schools set up during World War I did remarkably good work in training green men and women to run machines of various kinds. Some of the schools made it a point to show learners the fundamentals of machines and their operations. They showed them that no matter what the machine or how many tools it carried in the turret, as in the case of the Warner & Swasey machine mentioned, the principles of operation were much the same. They showed that all machine tools were operated by combinations of screws, gears and levers, counting cams as a sort of rotating lever.

Machine operations were shown in what may be called "dry runs," with no work in the chuck and the different movements were noted and explained. I am sure that some of this sort of fundamental instruction will help prevent waste of materials as well as injury to the operator.

Fred H. Colvin
Point Pleasant, N J

Our Error

We reviewed with interest the article entitled "Compound Angles" (*AM*—Aug 3 '53, p106) and would refer you to the formula:

$$\tan G, = \sqrt{\tan_2 D + \tan_2 E}$$

This should read:

$$\tan G, = \sqrt{\tan^2 D + \tan^2 E}$$

Inasmuch as the uncorrected formula might prove confusing, we have taken this opportunity of bringing it to your attention.

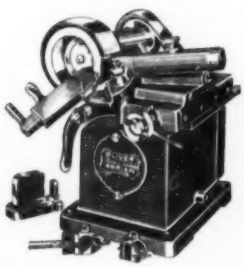
Camillo Honor, Jr
Methods Engineer
Sperry Gyroscope Co
Great Neck, N Y

Keep Your Toolroom Up to Schedule with . . .

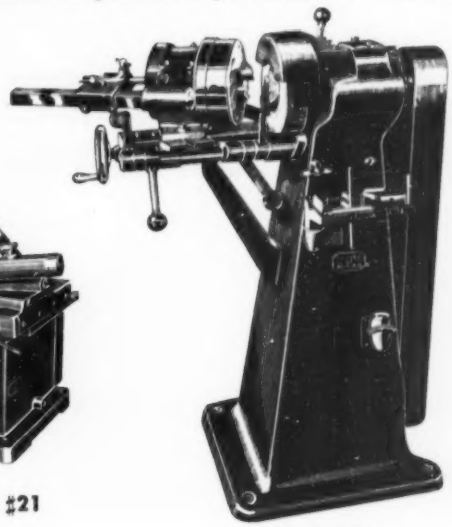
OLIVER DRILL POINTERS

Be Wise, OLIVERize . . . Open your toolroom door to Oliver Drill Pointers. They assure a balanced cut because each lip does equal work, eliminating excessive drill costs and imperfect holes usually traced to improper grinding. Start saving money now—the Oliver Way.

Tests prove that when properly machine ground, twist drill life is increased up to 300%. Oliver Drill Pointers sharpen drills to cut more accurately, last longer and produce more holes. They also reduce power costs. Added drilling pressure from poorly sharpened drills naturally increases the power load. This can't happen with drills ground to precision perfection on Oliver Drill Pointers.



MODEL #21



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No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances. Variable point angles. Automatic operation.
No. 21 Oliver Bench Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

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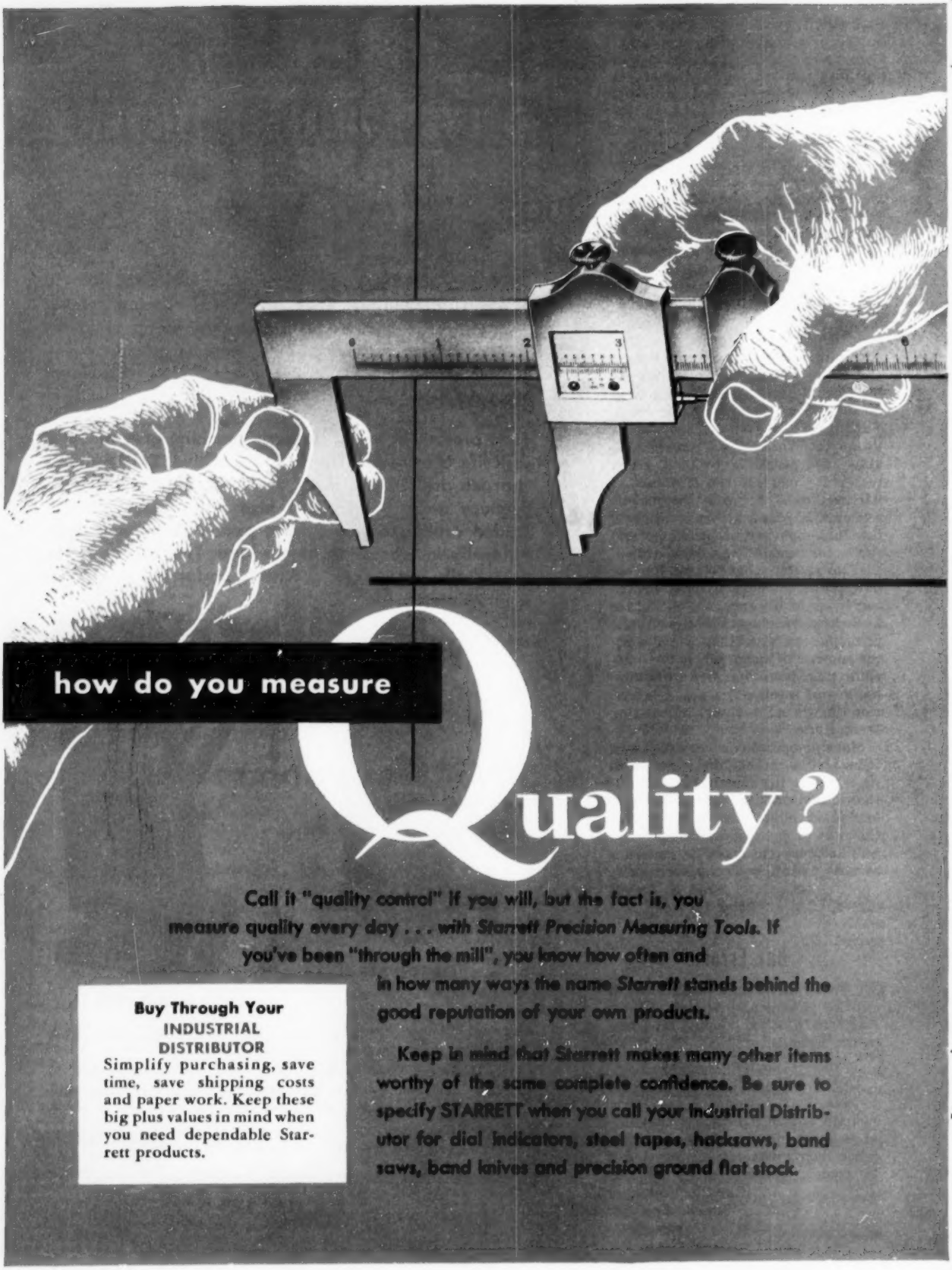

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Quality?

Call it "quality control" if you will, but the fact is, you measure quality every day . . . *with Starrett Precision Measuring Tools.* If you've been "through the mill", you know how often and in how many ways the name *Starrett* stands behind the good reputation of your own products.

Keep in mind that Starrett makes many other items worthy of the same complete confidence. Be sure to specify STARRETT when you call your Industrial Distributor for dial indicators, steel tapes, hacksaws, band saws, band knives and precision ground flat stock.

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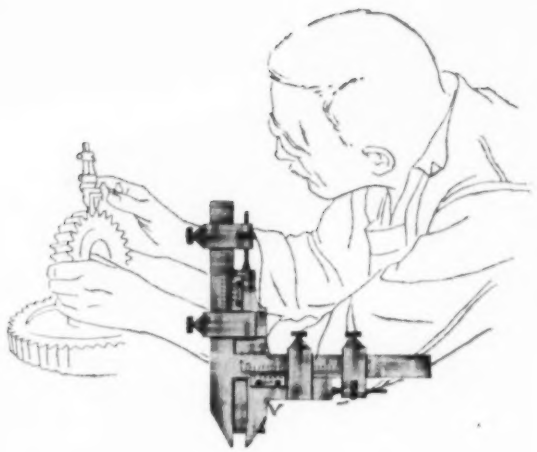
Simplify purchasing, save time, save shipping costs and paper work. Keep these big plus values in mind when you need dependable Starrett products.



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MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS

The name Starrett on tools is the hallmark of precision — a guarantee of accuracy, fine workmanship and complete dependability.

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Standard for quality and precision — a complete line for every gaging or production inspection application.

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Precision made by the World's Greatest Toolmakers for top performance, uniformity and maximum cutting economy.

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Made in four types, 295 sizes — air, oil, oil or water, and water hardening. Look for STARRETT, the mark of precision, on every piece.

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STARRETT TOOLS

Starrett®

WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY
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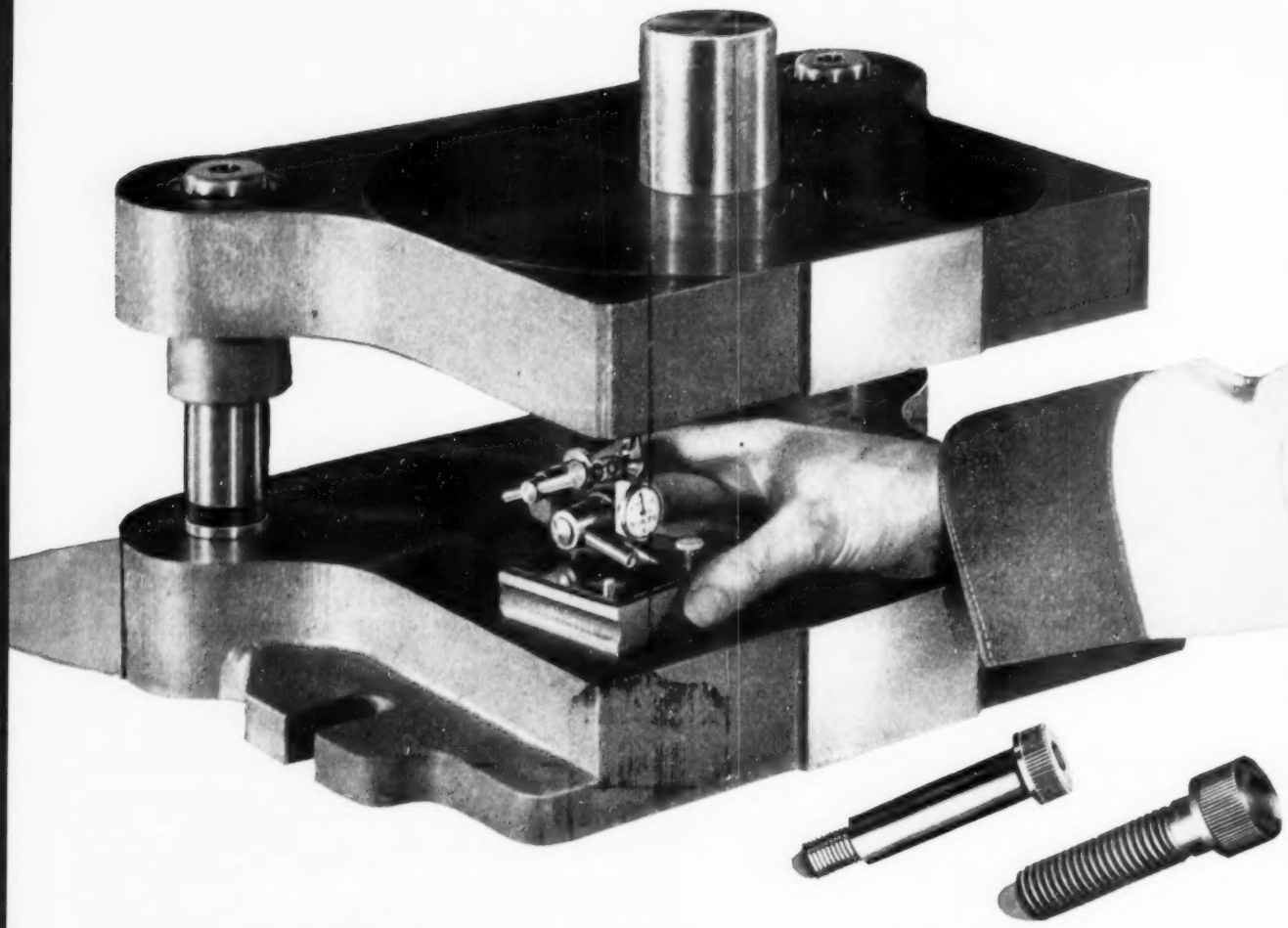

DIEMAKERS DEPEND ON DANLY FOR DIE SET ACCURACY

When it comes to meeting the precision requirements of the finest die work, diemakers everywhere *depend on Danly* Die Sets and Danly Diemakers' Supplies for accuracy. Precision machining, grinding, lapping and honing provide smooth, long-wearing surfaces with dimensional accuracy held within extremely close tolerances. On every component part, rigid inspection standards guard Danly quality.

Danly accuracy saves countless hours in the die shop, makes tooling-up much faster, insures longer production runs at lower cost. Why not bring Danly into your diemaking plans and get the results you're looking for. Remember, there's a Danly Branch near you. They're stocked for immediate delivery.

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INDIANAPOLIS 4—5 West 10th St.
***LONG ISLAND CITY**—47-28 37th St.
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***PHILADELPHIA** 40 511 W. Courtland St.
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**Indicates complete stock*

SPOT NEWS of Metalworking

- **Some Washington officials have proposed** that the Defense Department's $250 million Vance Plan fund, primarily earmarked for build-up of machine tool reserves, and additional mobilization planning funds in Pentagon's hands can be used to acquire any strategic production facilities in danger of being lost for defense purposes.

- **Screw machine products shop in Detroit has offered** any purchasing agent 5% commission on orders placed with it plus 20% of the profits. Offer was made in advertising in financial section of a local newspaper.

- **Additive that creates a foam blanket on surface of pickling acid,** preventing fuming and resultant corrosion of nearby machinery and wall surfaces and aiding in maintaining uniform pickling temperatures, is now on the market.

Military-Atomic Energy Commission set-asides for steel in the first quarter 1954 will be 20% lower than the current quarter's allotment; for copper 23% lower; for aluminum 18% lower. Reductions reflect recent cutbacks in military production.

- **Egypt will shortly ban importation of second-hand machinery** if a current bill is passed. Reason: use of second-hand machinery cuts production standards and increases costs to such an extent, Egyptian industry finds it difficult to meet foreign competition, even in spite of a high protective tariff wall.

- **Federal Communications Commission has cracked down** on three Chicago plastic molding firms whose dielectric heating units interfered with radio/TV reception. For information on how to prevent a similar shutdown in your plant, see "How to Certify Your Induction Heater," AM March 16, '53, p144.

- **British Columbia manufacturers will be taxed to support schools** under a new bill that levies assessments on all industrial machinery. The bill, which goes into effect in 1955, will tax 75% of all "improvements" (including new machinery) and 100% of real property in British Columbia.

Government Order M-41 is likely to be amended soon to decrease the "Take" of new machine tools for defense-rated orders from 60% of the total to 40%, in line with machine tool industry advisory committee to BDSA's recommendations. So-called critical list of machine tools will be abolished at the same time. See p103.

- **The effect of imports of foreign machine tools on the US machine tool industry** is to be studied by the Business and Defense Services Agency.

- **New dry-plate x-ray process develops image 45 seconds after photo is taken.** Advantages: re-usable dry plate is used instead of film; eliminates need for dark room; can be adapted to existing x-ray equipment; permits continuous x-ray examination, especially in foundry operations.

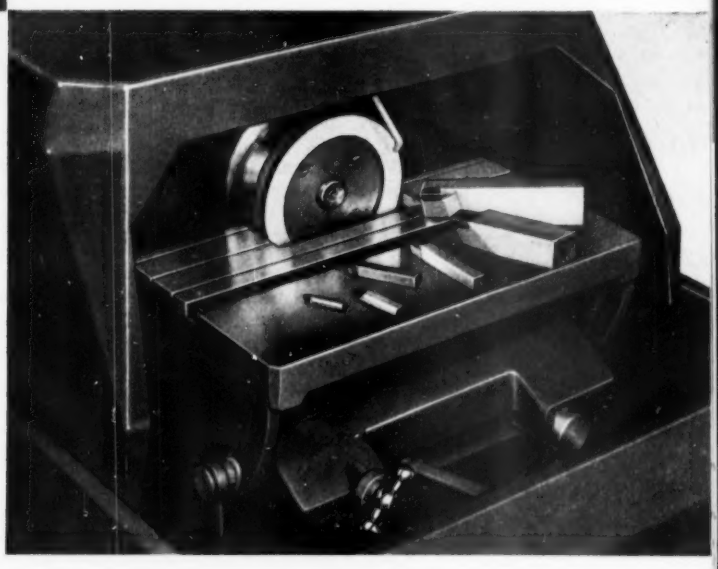
- **New high in industrial community relations** is being achieved by Ford Motor Co at Richmond, Calif, where plant management is teaching city officials industrial management methods in the interests of more efficient municipal government. Sessions are scheduled once a week for six months.

EVERYTHING YOU WANT IN A Tool Grinder

XLO
EX-CELL-O for PRECISION

A CHOICE OF MODELS FOR EFFICIENT CONDITIONING OF SINGLE-POINT TOOLS

Ex-Cell-O builds a complete line of tool grinders for the precision sharpening of carbide tools, and for a wide range of tool sizes from the smallest precision boring tools to large lathe and planer tools. All Ex-Cell-O Tool Grinders are double-end models with generously proportioned tool rest tables, and all are equipped for face grinding on steel-back wheels. These wheels are advantageous because the straight face gives correct tool angles without curves, and the surface speed remains constant throughout the life of the wheel. For fine finishing of small tools or for fast metal removal on large tools, there's an Ex-Cell-O Grinder to suit the needs of every shop, large or small.



For complete information on Ex-Cell-O Tool Grinders, contact your local Ex-Cell-O representative or send for Bulletin 46337.

Tables are of ample size to give good support to the range of tools for which the grinder is designed. In addition, tables are easily adjustable to the required angles, and are also adjustable toward the wheels to compensate for wheel wear. Slots are machined the full width of the tables to guide tool protractors and wheel dressers.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

53-45

Washington

The look-ahead for defense business shows a heavy hard goods take over the next several years. Naval shipbuilding and modernization will play a big part. Admiral Carney's speech in Pittsburgh calling for more atomic propulsion is just the beginning. Experts figure the fleet is facing rapid obsolescence in the 1958-65 period. So shipbuilding is likely to hit $700-800-million a year as the fleet is modernized. That's if Congress okays the programs.

Other hard goods spending will be high. Aircraft, now about $9 billion a year, isn't likely to drop below $6-7 billion for the next three or more years. Missile production and electronics contracting will increase. Ammunition, tanks, and trucks will drop off beginning next year.

Pentagon budget makers are still figuring on a level off point of about $35 billion, but the drop off will be gradual.

• • •

Pentagon will stay out of aviation and other strikes such as the one that UAW called against North American Aviation. There are a lot of reasons involved.

Normally, the military would get into such a strike involving the sole producer of the two top fighter planes we now have in production—the F-100 Super-Sabre and the F-86 Sabrejet. But stocks of the Sabrejet are high, and will stay high since there are no longer any losses in Korea. On this score, the military figures it can wait out the strike without stepping in.

Money enters the Pentagon thinking, too. The brass are having a hard time holding down expenditures to the $42-billion level this year. And any reduction in deliveries—and hence payments—will be a help in relieving the pressure to hold down spending.

It's difficult for the Pentagon to step into such a strike without in effect setting the terms and conditions of work for the entire industry. Pentagon would step in however, if it ever came to the point where the entire industry went out on strike.

• • •

Metalworking executives are taking over top jobs in the Commerce Dept. Lothair Teetor, board chairman of Perfect Circle Corp, Hagerstown, Ind., piston manufacturers, has been named Assistant Secretary for Domestic Affairs. Perrin G March III, President of Cincinnati Shaper Co, has been appointed BDSA's Assistant Administrator for Industrial and Agricultural Equipment. Marshall Smith, onetime E W Bliss vice president and more recently Paris executive for Emhart Manufacturing Co, is slated to become Deputy Assistant Secretary for International Affairs.

The newly reorganized ODM is beset by internal squabbles over who's to be responsible for what. Hemmed in by bureaucratic jurisdictional disputes, William S Lambie, former senior vice president of National City Bank of New York, has resigned in disgust as ODM Assistant Director for Financial Policy. His job was to supervise the Tax amortization program and act as comptroller of the Defense Production Act's $2.1-billion treasury borrowing authority, which underwrites much of the defense expansion program.

ODM Director Flemming has been unable meanwhile, to lure a private businessman into his agency as Assistant Director for Production and Requirements. Official holding this job will have major responsibility over government idle tool inventories and other matters directly affecting metalworking industries.

• • •

Progress is being made on the Defense Dept supply catalogue. That's the job that Congress called the "chamber of horrors" a couple of years ago; it threatened to put the squeeze on appropriations if the military didn't unify supply specs and cut duplications. Defense will report to Congress after the first of the year on cataloging progress and give an expected completion date.

• • •

Chances of revising Taft-Hartley next year are better now that James P Mitchell has replaced Martin P Durkin as Secretary of Labor. Mitchell, from management, has a good reputation among union leaders. He will have less difficulty than Durkin, a union leader and Democrat, joining in an administration program for T-H revision.

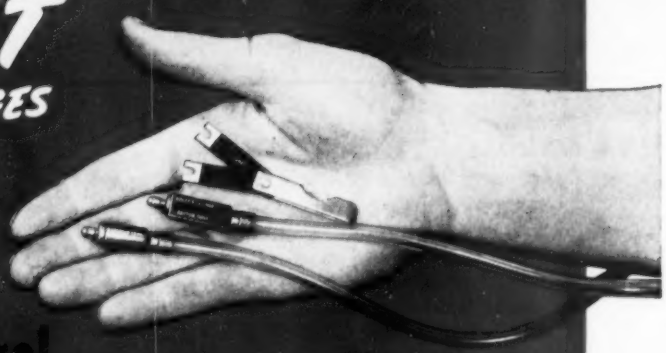
Even so, the odds are still against changes in the labor law before 1954. Union leaders are convinced that any amendments by this Congress will not be in favor of organized labor. They prefer to keep Taft-Hartley as an issue in next fall's elections. Then, too, many in management would like to leave the Taft-Hartley Labor Law as is.

• • •

Left-wing unions are running into more trouble from the Eisenhower administration than they encountered under the Democrats. The National Labor Relations Board is refusing to hold bargaining-rights elections sought by any union having an officer under indictment for signing a false non-communist affidavit. Thus far it affects only two unions, Fur Workers and Marine Cooks. But several more indictments will be sought against other left-wing unions in the future.

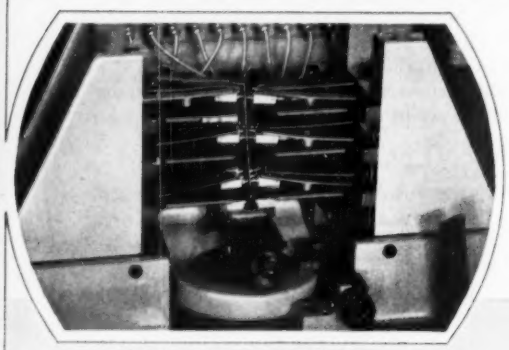
PLUNJET
GAGING CARTRIDGES

WIDELY USED
For Inspection and Machine Control



The Plunjet is made with both rectangular and cylindrical short and long housings.

Plunjets with Precisionaire for checking jet engine blades.



Jet blade fixture using Plunjets.

PLUNJET GAGING CARTRIDGES . . . the self-contained gaging heads you can use practically everywhere, were developed by Sheffield in 1949.

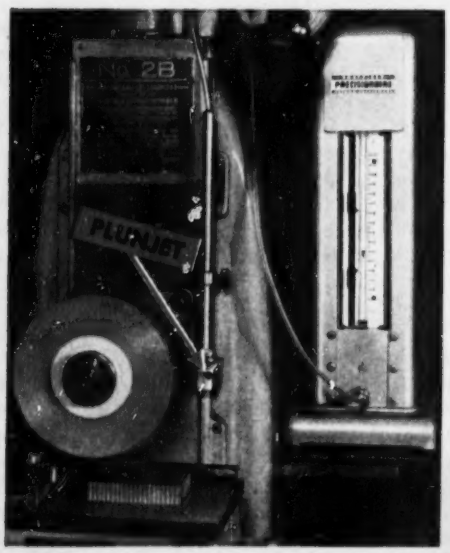
THOUSANDS ARE NOW IN USE on a wide variety of gaging fixtures and machine control applications.

MORE THAN FIVE THOUSAND are used on gages for checking jet engine blades.

PLUNJET GAGING CARTRIDGES ARE STANDARD LOW-COST STOCK ITEMS which can be applied by users to practically any gaging fixture or machine tool control where indication is required.

***WRITE FOR ENGINEERING DATA** giving ranges, amplifications, applications, mounting dimensions and prices.*

IMMEDIATE DELIVERY FROM STOCK



Plunjet feed gage enables operator to grind to a degree of accuracy previously impossible.

6302

SHEFFIELD HEADQUARTERS

the **Sheffield** corporation

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Detroit

Auto rumors this fall can be likened to autumn leaves: They are as colorful, almost as numerous and are floating around just as haphazardly.

• • •

Rumor 1: General Motors is trying to buy the enormous Willow Run plant from Kaiser Motors. Judgment: Entirely likely, since GM has invested so heavily in the plant in an effort to revive Hydra-Matic transmission production that it might well be economically sound to take over the complete "shop," Kaiser willing. This despite earlier GM statements that the burned-out Livonia plant would be rebuilt.

• • •

Rumor 2: Kaiser will quit making Henry J's. Judgment: The big man's little namesakes almost certainly will be dropped from the Kaiser-Willys line, since they fall directly into Willys' price and size domain, therefore put K-W in the position of competing with itself.

• • •

Rumor 3: Kaiser will quit making Kaisers. Judgment: Almost certainly false, according to earlier comments by Henry and Edgar Kaiser. Both have reaffirmed repeatedly their determination to stay in the auto making business, come hell or the Big Three.

In view of the elder Kaiser's record, it's not likely that he will quit now. If the stylish Kaisers were abandoned, the family—through Willys—would still be in the business, but only in a backdoor sort of way. Moreover, the company is well along toward production of a V-8 for installation in the 1955 Kaisers.

• • •

Rumor 4: Nash and Hudson will merge. Judgment: Merger rumors in Detroit are like peonies—perennial. But this rumor, largely because it has not been specifically denied, carries more weight than most merger reports.

Both companies are decidedly off their production and sales paces of a year ago in terms of industrywide percentages. Caught, as are others, between the monumental endeavors of Ford and GM, any realignment which will provide the two independents with opportunity to lower costs and increase sales would be sensible.

• • •

Rumor 5: Chrysler will buy Briggs Manufacturing Co. Toward the end of October, this rumor (which was on the verge of dying of old age) was the only one of the five to have firmed up as a distinct fact. The outright purchase of Briggs' auto body plants by Chrysler had been regarded for some time as a solid possibility.

The $35-million deal gives Chrysler a chance to affect manufacturing economies not possible as long as all Plymouth, and some De Soto, Dodge and Chrysler bodies came from the outside.

• • •

GAW—the guaranteed annual wage—is a long way from reality in the auto industry, where important labor contracts are not reopenable until mid-1955. As far in the future as it may be, GAW is stimulating much conversation and provoking many guesses as to which company Walter Reuther, CIO Auto Workers president, will select as a target.

Some GM officials consider their company the most probable choice on grounds that GM has pioneered a goodly share of labor's advancements. Some Chrysler officials think their company will be the bull's-eye. Reasoning: UAW bosses have been outspokenly bitter in their criticisms of Chrysler management ever since the 100-day pension strike in 1950, may choose to make Chrysler take on the initial burden.

Actually, there is no way now of determining UAW's target. Strategies will hinge importantly on competitive standings within the industry at the time negotiations begin. (Which company would stand to lose the most in a strike?)

One thing is sure: From the standpoint of internal politics, Reuther cannot back away from the GAW demand. He has committed himself to the goal without reservation.

• • •

Passenger car production in early November was edging near to the 5.5-million mark, with the major contenders, Ford and Chevrolet, each putting out about 30,000 cars a week. Late in October, total car and truck production had passed the 6.3-million mark, making 1953 the third best production year in history. Sometime this month, 1953 will install itself as second only to 1950 in terms of total production.

• • •

Look for intense scrapping to develop among manufacturers of power steering units. Ainsworth Manufacturing Corp., Detroit, has entered the field with an integral power steering unit for cars, buses, trucks and tractors.

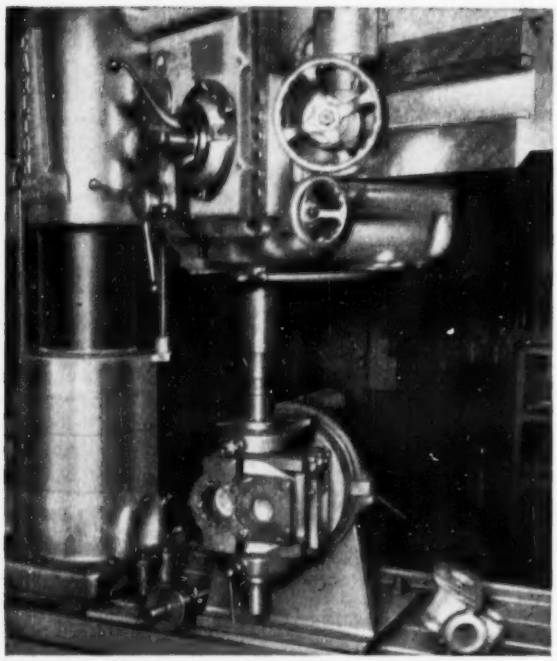
The unit weighs just over 36 lb and requires much less space under the hood than contemporary units, which weigh from 67 to 90 pounds.

Ainsworth's price, while not announced, may run as much as 40% under competitors' units, which generally go to auto makers from $50 to $80. Cost of the Ainsworth unit to manufacturers may be roughly in the $30 area.

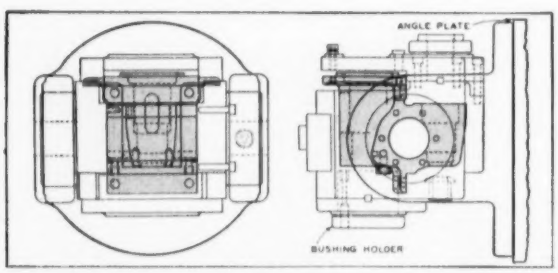
The company has no customers as yet, probably won't find any for the 1954 car model run. But four manufacturers are running tests on the unit. The company has not yet established manufacturing facilities for the unit, although tool design has been completed.

TRUNNION FIXTURE MAKES RADIAL DRILL DOUBLY PRODUCTIVE

Five sides of part machined in one set-up



Rough boring the cylinder hole in the double trunnion jig on a Carlton radial drill is followed by finish boring without unclamping the trunnion. This bore is through the hollow journal on which swings the inside work-holding gimbal. The rough workpiece casting is shown beside the jig.



Trunnion fixture allows workpiece to be revolved through arcs in planes that are 90° to one another. The workpiece (shaded area) is clamped into the inside member by a leaf. On its side are hollow gimbal bearings in the two arms of the yoke which has a single thrust bearing with the upright arm of an angle plate, the bottom leg of which is clamped to the base of the radial drill. The yoke pivots on this back plate. Both revolving members can be clamped in any position by indexing pins, or friction clamps. Holes bored in the inner member accept bushings for some of the larger boring cuts.

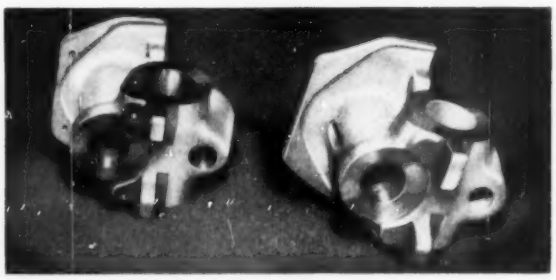
The double trunnion fixture shown here was developed for the Carlton Machine Tool Co., Cincinnati, for use on Carlton radial drills. Carlton does not manufacture fixtures of any kind, nor does it recommend one manufacturer's jigs and fixtures over another. The idea described here is suggested for the benefit of Carlton customers who may find this technique helpful.

Using this fixture, 36 different drilling operations can be performed on 5 sides of the part shown below—in 90 minutes! This arrangement offers the two elements of production line performance: reducing set-up time and making precision machining easier.

The jig is bolted to the bed of the Carlton radial drill and permits the workpiece to be rotated through 360° of arc in one plane and through 180° of arc in a second plane at right angles to the other. Rotating members can be clamped in any position throughout their spans of arc. The radial drill junctions as would a boring mill.

All the boring, drilling, tapping and reaming tools required for this particular workpiece are stored together as a unit, intact for the next run. This method speeds up floor operations because the operator is freed from the necessity of locating and assembling the several boring bars, drills, taps, counterbores and reamers that may be needed for completing every operation in a job set-up.

Similar jigs and fixtures can be planned for you by Carlton engineers. Why not send your requirements today to the Carlton Machine Tool Co., Cincinnati 25, Ohio.



Without removing the arm clamp body from the jig, 36 hole drilling and machining operations are performed on the part as shown at left: drilling, tapping, boring and facing. The rough casting is shown at right.

(Advertisement)

Machine Tools

Government order M-41 controlling machine tools is in process of being amended.

No firm decision has yet been made as to the exact terms of the amendment, but these predictions can safely be made:

The so-called critical list of machine tools, now split 70% defense-rated and 30% non-defense, will be abolished. Most of the types of machines now on the list are no longer critical. Only a handful of machine types are still in a critical category.

The present ratio provided in M-41 for other than critical machines will be reduced from 60% for defense-rated orders to 40%. Slackening of defense business makes this change desirable. Currently only 17% of machine tool orders carry military priorities.

• • •

Builders will be required to submit their order boards to Washington for checking only upon request from BDSA. At present builders of critical machines must send in their order boards every quarter.

The "freeze" period of three months on machine tool production schedules is to be continued. It will not be extended to six months on certain tools requiring long lead time, as recommended by the Machine Tool Manufacturers Advisory Committee meeting in Washington on October 21.

The Advisory Committee advocated elimination of the critical list, reversal of the 60%-40% ratio, and a complete end to submission of order boards to Washington.

• • •

Chances are that the proposed revision of M-41, as sponsored by the Business and Defense Services Agency, will go through.

Pentagon officials are reported to be sympathetic, for the most part. They are reluctant to abandon the critical list altogether, though admitting that it should be drastically cut.

BDSA was asked by the Machine Tool Advisory Committee to undertake a study of the impact of imports on the U. S. machine tool industry. The industry is believed to be strongly opposed to a further lowering of the tariff on machine tools, which stands today at 15%.

The Advisory Committee registered strong opposition to leasing of government-owned machines for other than defense production and also to the sale of these machines.

Machine tool imports into Japan will exceed $4 million this year, and more than half of that amount will be supplied by U. S. builders.

An expansion of purchases of foreign machine tools by Japanese manufacturers is believed certain the next few years, with the intake going as high as $10 million a year.

The big push for machine tool imports will come from Japan's armament industries, which will be aided by the upcoming Mutual Security Agreement with Washington.

Cosa Corp will show American machine tools this month at the truck plant near Tokyo of Isuzu Motor Co.

Charles J. Baker, formerly head of the industrial machinery division of the Foreign Economic Agency and well known to the machine tool industry, has become a business consultant to machine tool companies on Washington problems.

• • •

General Motors has received at Willow Run 2789 machine tools (as of October 26) to produce Hydra-Matic transmissions. About 2000 of them have been installed. Corporation officials have declined to say how many of these machines are new and how many have been rebuilt from the Livonia fire.

Willow Run production of Hydra-Matics will begin the latter half of November and will reach a peak shortly after January 1.

Production of Hydra-Matic units at the reactivated Riopelle plant in Detroit will be up to 1200 a day shortly.

GM recovered 3318 machine tools from the Livonia ruins. It will take more machines at Willow Run at the outset than at Livonia to do the same work, because some of the multi-purpose tools now being rebuilt are not yet ready.

General Services Administration has completed a campaign to secure a reduction in its pool-order obligations for machine tools.

Builders have voluntarily cancelled upward of $50 million of pool orders.

This cuts down GSA's outstanding pool contracts to less than $150 million.

Cancellations do not necessarily represent a loss in backlogs to builders. They simply mean that builders have relieved GSA of legal liability for guaranteeing the orders, if these orders or any part of them should be washed out by defense contractors later on.

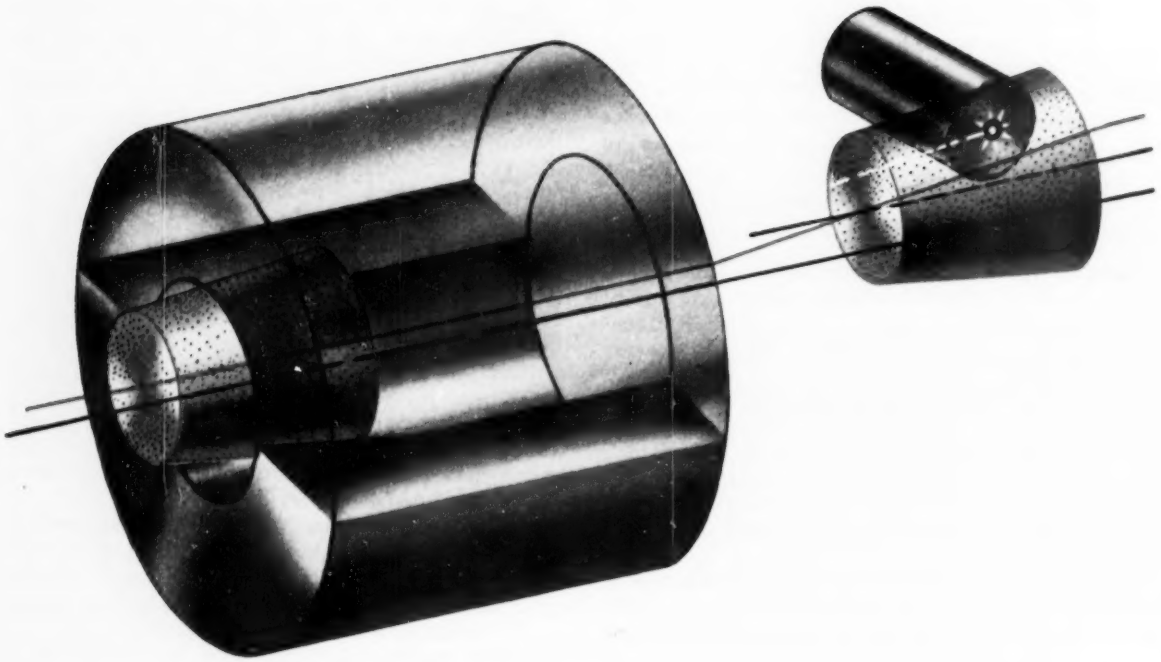
GSA now owns in excess of 500 machine tools that pool contractors have not yet sold. In all cases except one, GSA has entered into agreements with builders of unsold machines giving them exclusive sales rights for 12 months beyond the original contract expiration date.

Marshall Smith, first director of NPA's Metalworking Division, is back in Washington as deputy assistant secretary for foreign affairs of Commerce Dept.

BF

alignment

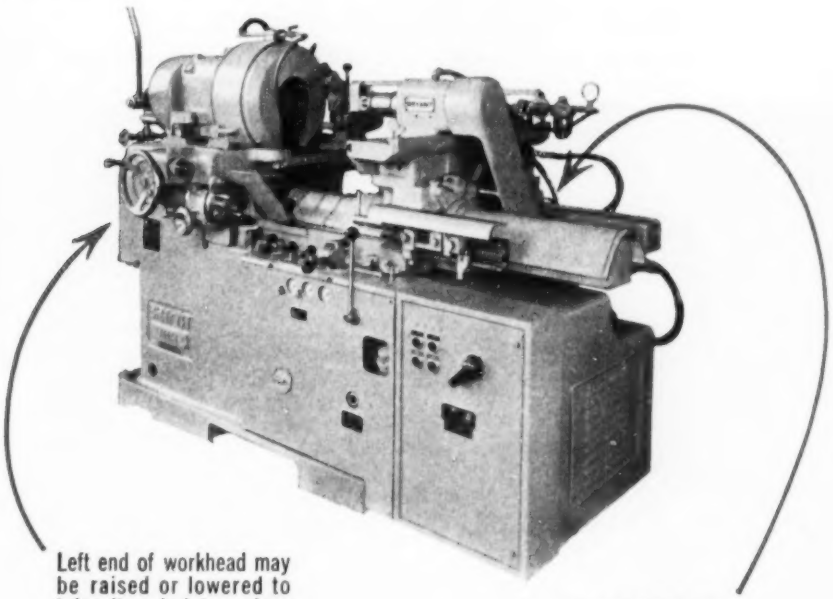
for better internal grinding



IT is common assumption in internal grinding that once the grinding wheel passes the diamond, all errors will be eliminated and the wheel will be a perfect cylinder. It is also assumed that this grinding wheel can produce a straight hole. These two assumptions are true if the wheel path is a straight line parallel with the axis of the wheel as it passes the diamond and traverses the work.

In the illustration, the wheel slides are badly worn and the wheel path is not a straight line. The distortion in the ways causes the wheel to move gradually away from the diamond and the wheel is dressed to a taper as it passes the diamond. Then, as the tapered wheel traverses the work, it will grind only on its large diameter. At the point of reversal the tapered form will be transferred to the work. If the traverse stroke is lengthened, the tapered section will be moved to the new point of reversal. In addition, wheel wear will be excessive, finish will be poor, feed lines may be visible.

Available information advises simply turning the workhead or changing the length of traverse to correct taper. In the case illustrated, neither turning the workhead nor changing the length of traverse will produce a straight hole. The only possible remedy is to straighten the wheel slide ways which will, in turn, straighten the wheel path. The wheel will then contact the work properly, producing correct geometry of the hole, longer wheel life and better finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This machine is for general purpose hole grinding. It has convenient centralized controls and all features necessary to handle a variety of work with minimum time and effort needed for changing jobs. For stable 3-point support, the wheel spindle is mounted on a cylindrical bar which is supported on 2 cylindrical bearings. The rear of the slide is supported on a hardened and ground guide plate. Workhead may be swiveled for grinding tapers up to 90° included angle. Provision is made for mounting a face grinding spindle in addition to the hole grinding spindle. The No. 1116 will swing 16″ with 12″ max. hole depth. Write for folder.

Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

Bryant Chucking Grinder Company

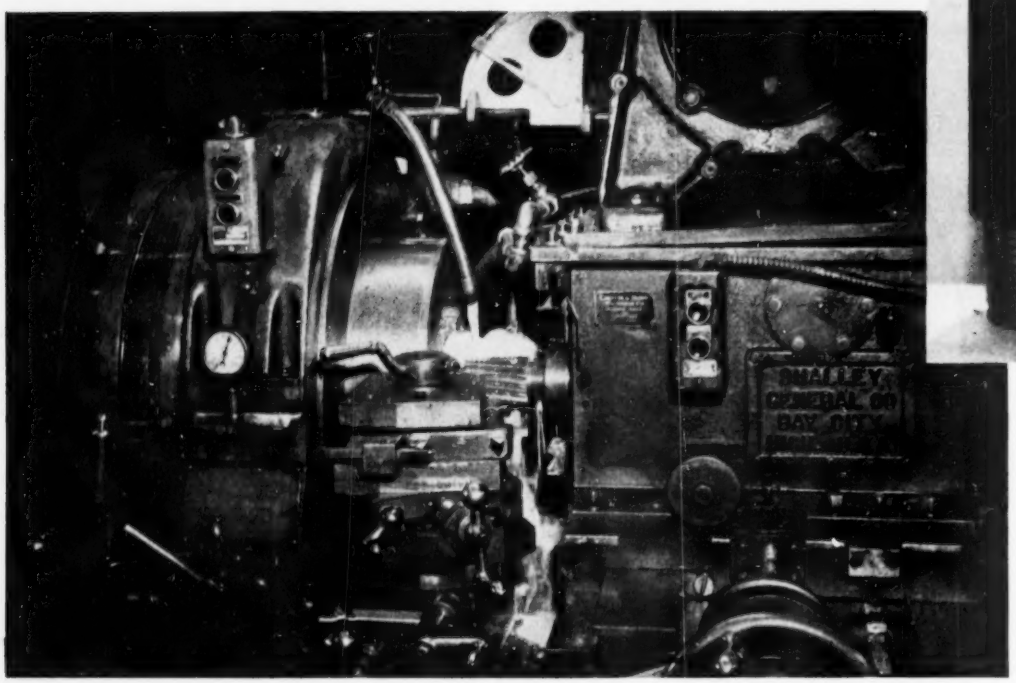
Springfield, Vermont, U. S. A.

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Boring Machines

EXCELLENT FINISH AND *NO RUST!*

"Texaco Soluble Oil has saved us thousands of dollars."

— George C. Long, Superintendent
Hydril Company, Rochester, Pennsylvania



ONE of the important steps in making the Hydril Company's patented Twinpin Connectors is the milling of a step thread. The job is done on Smalley General Thread Millers, using a 1:20 emulsion of *Texaco Soluble Oil C.*

"We get excellent finish and tool performance," says Superintendent Long, "but we are most impressed by the rust-preventing ability of *Texaco Soluble Oil.* Our greatest problem was rusting. At one time, circumstances forced us to keep thousands of dollars' worth of finished parts exposed on open pallets for four and a half months in severe humidity. We can thank *Texaco Soluble Oil* for the fact that *we had no single case of rusting or indication of rust on the parts.*"

Let a Texaco Lubrication Engineer help you get similar results in your plant. There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to assure better, faster, lower-cost machining of every kind.

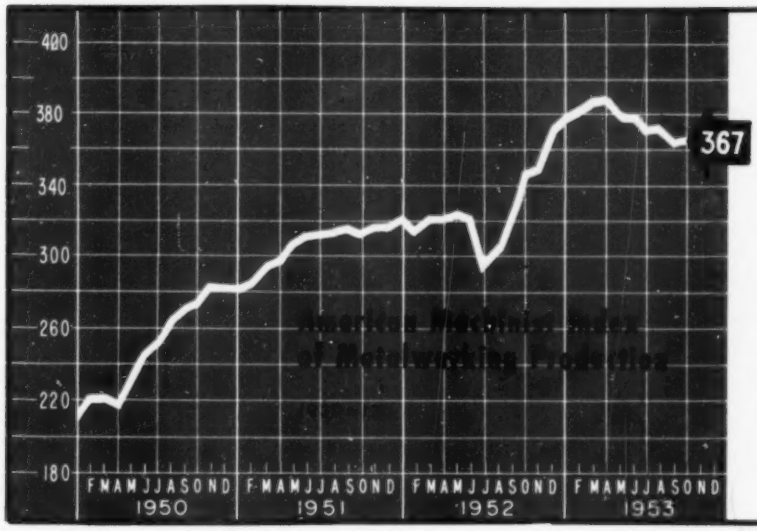
Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	SEPT '53(*)	AUG '53(p)	JULY '53(r)	SEPT '52
Tot. Index	**367**	**367**	**364**	**330**
Machinery	317	320	303	
Electrical Machinery	425	418	383	
Autos	297	286	242	
Other Transportation	603	601	550	
Other Metalworking	367	365	325	

(*) Estimated (p) preliminary (r) revised

Capital investment in new plant and equipment promises to give major support to Metalworking at least up to the middle of next year.

Latest check made by the McGraw-Hill Department of Economics reveals no abatement in the rate of spending is anticipated. If anything, the total outlay may be bigger next year than this year.

This fact strengthens the belief that Metalworking is not in for a spell of sharp downward readjustment, as some other industries are.

• • •

Metalworking production is off a bit from its record-breaking pace. Aside from a few spectacular layoffs, however, the decline has been gradual.

Men are not working as long hours as they were. Those who formerly were drawing pay for 50 hours a week now are on a 45-hour week. And those who used to work 45 hours are down to 40.

Help-wanted ads for skilled operators still fill many pages in local newspapers. That is hardly good evidence of a dearth of work.

• • •

Aviation promises to be one of the bulwarks of metalworking operations in the months ahead.

Despite stretchouts and cutbacks, aviation output will continue to be big. Parts makers report that capacity production will prevail the rest of this year and well into 1954.

Backlogs of aviation parts companies are not as large as they were, but are stil formidable.

Subcontract work is being drawn back into prime contractors' plants, however, as business shrinks.

Most subcontractors are allowed to complete current contracts rather than be halted abruptly by cancellations.

• • •

Builders of heavy electrical machinery still are running at or near capacity. They expect to stay on full schedules indefinitely.

Industrial machinery manufacturers are not doing as well as they were. Orders have dropped and some companies have curtailed production.

Earth-moving equipment sales are down. But the volume still is far above any previous period aside from the recent all-time peak.

Durable goods in general are trending toward lower levels in both sales and production.

• • •

Outlook for farm equipment and tractors remains uncertain. Best guess is that retail sales will stay close to the current volume for some months. Bear in mind that today's volume represents a sharp slump from the peak.

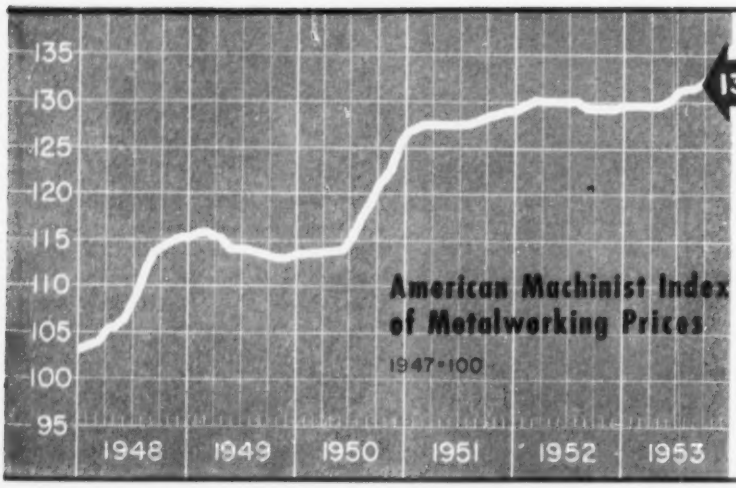
Dealers' inventories of farm equipment are high and must be worked off before production schedules can be stepped up. Output today is not much more than half what it was at the 1953 high.

• • •

Automobile parts makers are doing surprisingly well. They had the best third quarter in history. And production this quarter will be up to that in either the first or second quarter of '53.

Some steel mills say that the January-March period just ahead looks better to them than the present quarter. Total tonnage produced probably will equal that in the same quarter this year, though the operating rate may average only 90%. Increased productive capacity is the answer.

Gaging Business



PRICE INDEX

	SEPT '53(*)	AUG '53(p)	JULY '53(r)	SEPT '52
Total Index	**132.4**	**132.4**	**132.1**	**129.6**
Metalworking Machinery	**141.6**	**140.9**		**138.0**
Other Machinery exc. Electrical	**136.8**	**136.4**		**132.2**
Electrical Machinery	**131.1**	**130.7**		**124.6**
Fabricated Metal Products	**129.0**	**128.8**		**128.0**

(*) Estimated (p) preliminary (r) revised

Not one major industry showed signs of an upturn in September. Even the chemical industry, which has set a new record each month since the early part of the year, dropped off.

• • •

Index of Industrial Production is estimated at 232 for October (1935-39 = 100), and the September Index was revised down to 225.

Reasons for October's expected small increase: higher steel output, more autos.

Economy is still at a high level. But it's about 10 points under the spring peak.

• • •

Non-agricultural employment held at peak levels in September. But the gain over August was smaller than usual for the season.

Employees on non-farm payrolls totaled 49.6 million —700,000 above a year ago.

In the Post-World War II period, non-farm employment averaged a gain of 500,000 between August and September.

But this time the gain was only 200,000. Reason for the small rise: no seasonal increase in manufacturing.

• • •

Hourly wages of production workers employed in the nation's plants averaged $1.78 in September.

This is only a 4% increase since the beginning of the year.

• • •

Average weekly paycheck of factory workers in September was $70.49—this was slightly lower than August paychecks.

• • •

But production workers' pay was $1 per week more than in September 1952.

• • •

The average workweek declined in September to 39.6 hours—almost a full hour less than was worked in the average week in August—and the least number of hours worked in any month since November 1949.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	252.6	252.5	244.7
Steel ingot operation (thousands of tons)	2,112	2,142	2,229
Electric power output (million Kilowatt hours)	8,306	8,265	7,696
Production of automobiles and trucks	150,002	152,743	144,747
Engineering construction awards (*Eng. News-Record*—millions)	$358.4	$289.3	$276.9

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	232	235	228
Index of durable manufactures production (1935-1939 = 100)*	303	309	290
Durable goods manufacturers' sales, millions*	$12,713	$13,144	$10,437
Electrical machinery manufacturers' sales, millions*	1,462	1,352	1,168
Other machinery manufacturers' sales, millions*	2,033	1,992	1,833
Durable goods manufacturers' new orders, millions	9,829	11,078	9,998
Electrical machinery manufacturers' new orders, millions	1,105	1,423	1,066
General machinery manufacturers' new orders, millions	1,635	1,652	1,515

* Seasonally adjusted

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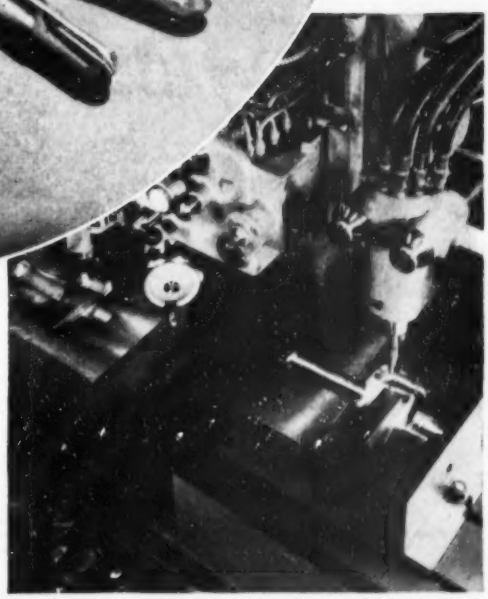
You get more work between grinds . . . with these *extra rugged* T-J Die Sinking Milling Cutters. That's why they're top favorites in die and forge shops everywhere! T-J Cutters are correctly designed for speed, accuracy and long life . . . hold a sharp edge longer . . . less breakage! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes to *reduce your die costs!* Send for new catalog 4-153. The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY **T-J**

TOMKINS-JOHNSON

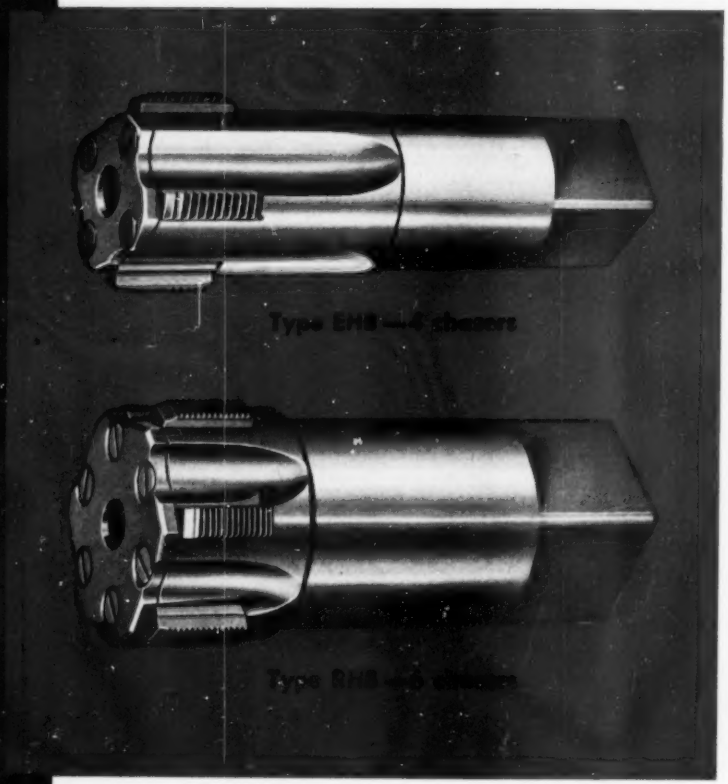
RIVITORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHORS



T-J Cutter at work on a Cincinnati 16" Vertical Hydrotel, latest design Die Sinker. A cutter of the right design and heat treatment for this high speed work in tough die steels, making posible the maximum efficiency of these new machines.

SALVAGE PARTS

HAVING ROUGH, TAPERED, BURRED OR UNDERSIZE THREADS WITH A MURCHEY ADJUSTABLE TAP



If you want the quick, low-cost means of salvaging tapped threaded parts, use MURCHEY SOLID ADJUSTABLE TAPS. Merely adjust the chasers to the proper pitch diameter and re-tap to bring threads within tolerance limits.

The first cost is usually less for a Murchey Solid Adjustable Tap than for the conventional solid tap. And additional savings can be substantial because of the many taps it can outwear.

Chasers can be ground on the chamfer and face many times before being replaced—and then only the chasers (not the tap body) are replaced at a nominal price.

Write Dept 1 for Bulletin MU 153 for sizes and capacities.

Lower Cost per Thread

MURCHEY DIVISION OF THE MURCHEY SHEFFIELD CORPORATION DAYTON 1, OHIO, U.S.A.

6166

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHING 1877

A MYTH IS SHATTERED

If you have been lulled into the belief that American industry is a model of efficiency and high productivity, you are in for a shock. It is not.

A high rate of efficiency has been achieved here and there, it is true. And sometimes it is of spectacular proportions. But if you will take the trouble to penetrate into the heart of America's metalworking industries, you won't like what you find.

American Machinist editors have done just that. They have spent many months taking the Seventh American Machinist Inventory of Metalworking Equipment. The results of this Inventory, and all the detailed figures, are being published in 96 pages in the 1954 Production Planbook to be mailed to all subscribers the middle of this month.

The facts and figures turned up by this Inventory shatter the myth that U. S. metalworking factories are humming in every city, town and hamlet with automatic machines of the latest design. They may be humming, but the noise is from machines mainly distinguished for their obsolescence in age and design.

More than a million machine tools, out of less than 2 million in the metalworking industries, are 10 years old or older. Manufacturers using these outmoded machines cannot take advantage of the remarkable postwar developments providing greater power, higher speeds and feeds, automatic cycling and work handling.

One out of five machines, almost 400,000 units to be specific, is more than 20 years old. Even by the incredibly low depreciation standards that the Treasury Department sets for tax purposes, these machines have outlived their usefulness. Most of them are so inefficient that they constitute little more than junk.

Two out of three machines are of a design antedating World War II. Thus a substantial portion of America's metalworking goods are being produced on machines designed back in the 1930's and even in the 1920's.

The percentage of old metal-forming units is higher than that of machine tools. One out of every four units is more than 20 years old, and almost three out of five are 10 years old or older.

Never before in the history of American Machinist Inventories, dating back to 1925, has so much old equipment been so widely distributed throughout the nation. In every one of 15 industrial classifications at least 45% of the machine tools are 10 years of age or older. There is more over-age equipment than ever before in 36 out of 39 machinery types surveyed.

There is not space to continue further this dreary and depressing report on the state of the nation's metalworking equipment. Enough to say that after a three-year period of intensified building of production equipment for defense purposes we are worse off, in average age of machines, than we were just before Korea. And at that time, in 1949, the age level had risen since the end of World War II.

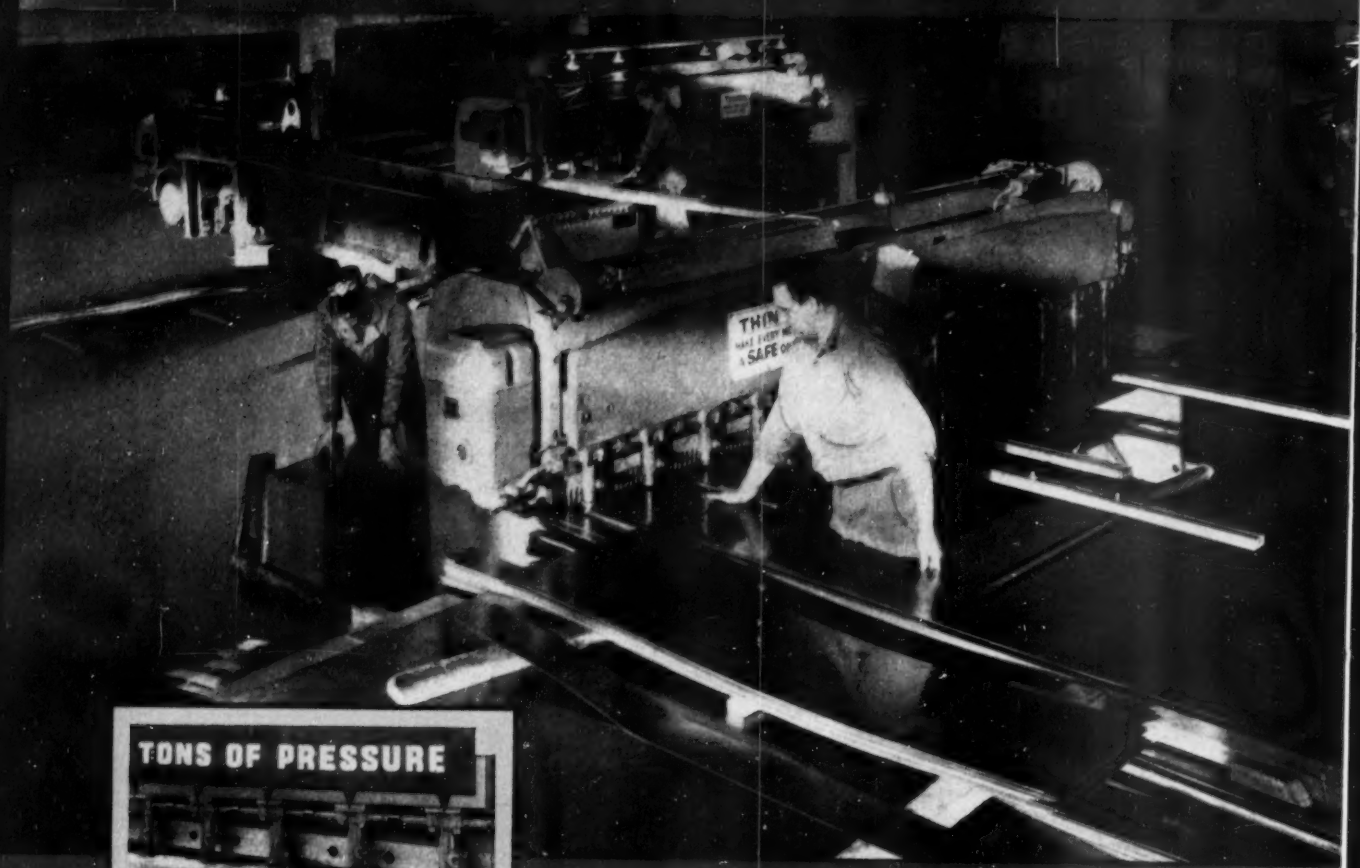
The implications of the Inventory are clear. The metalworking industries need to clean their houses of antiquated equipment that inevitably results in excessive production costs. The job is too big to be done in a short time. It will take years. But a start should be made now.

A hit-or-miss program won't do. Instead, manufacturers should plan regularized replacement of old equipment on a continuing basis from year to year. This replacement should not be by guesswork but by measuring the profits to be gained in dollars and cents by substituting new machines for old. The formula devised by the Machinery and Allied Products Institute is the best known of the measuring devices.

A mere handful of companies now have in operation such a regularized replacement policy. Only if more metalworking managements adopt and adhere consistently to this policy can we hope to stem the rising tide of overage equipment.

Burnham Finney

ACCURACY is necessary



Micrometer accuracy starts with Cincinnati Hydraulic Holddowns. They exert tons of pressure and automatically hold all thicknesses of work securely.

...AND THE SPEED AND VERSATILITY OF CINCINNATI SHEARS IS NEEDED, TOO

Here at The W. J. Holliday Company, Inc., The Department Store of Steel—these busy Cincinnati Shears operating continuously, shear accurate blanks to customer size.

They handle cold finished, or pickled and oiled sheets up to 10 gauge and hot rolled sheets up to ¼". Both management and operators are enthusiastic about their Cincinnati Shears.

Write for Shear Catalog S-6.

Photos courtesy The W. J. Holliday Company, Inc., Indianapolis, Indiana

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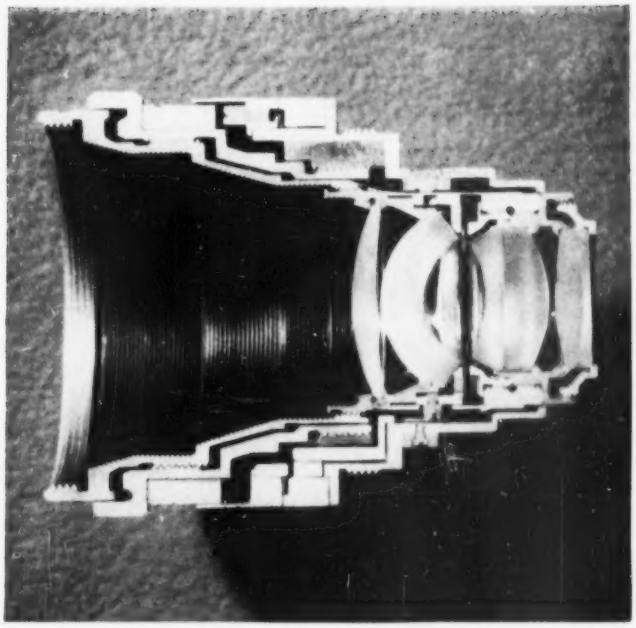


CROSS-SECTION of a Kodak Ektar lens assembly. Recent functional requirements have led to an increased complexity of design

..WHEN AUTOMATICS MAKE INTRICATE PARTS

Hand operations are mechanized in Automatic Screw Dept 16 at the Hawk-Eye Works of the Eastman Kodak Works, Rochester, NY. As a result, the master-craftsmen product of 65 years ago improved in materials and design, is produced at reasonable cost

TODAY at Eastman, intricate camera parts are produced on automatics with equal or greater precision than was formerly possible when they were entrusted to skilled craftsmen.

Five-spindle automatics are used to produce such elements as lens assemblies, filter mounts, and lens hoods. Brass and aluminum are the common materials, with brass preferred for closer tolerances and stability. To keep the work load stabilized, job lots are small and runs are short. Thus, seasonal shutdowns are avoided.

Typical runs range from 1000 to 5000 pieces. These quantities are justified by a maximum setup time of 12 hr. When larger runs are required they are broken into smaller lots which can be handled more advantageously.

Using nine Warner and Swasey 5-spindle automatics, many production advantages have been realized, including a higher yield of usable parts far exceeding the previous combination of single-spindle machines and optical lathes. With the old combination, production runs consisted of machining large batches of female parts, then machining the male component to match the two parts in pairs. Invariably the carefully matched parts became separated.

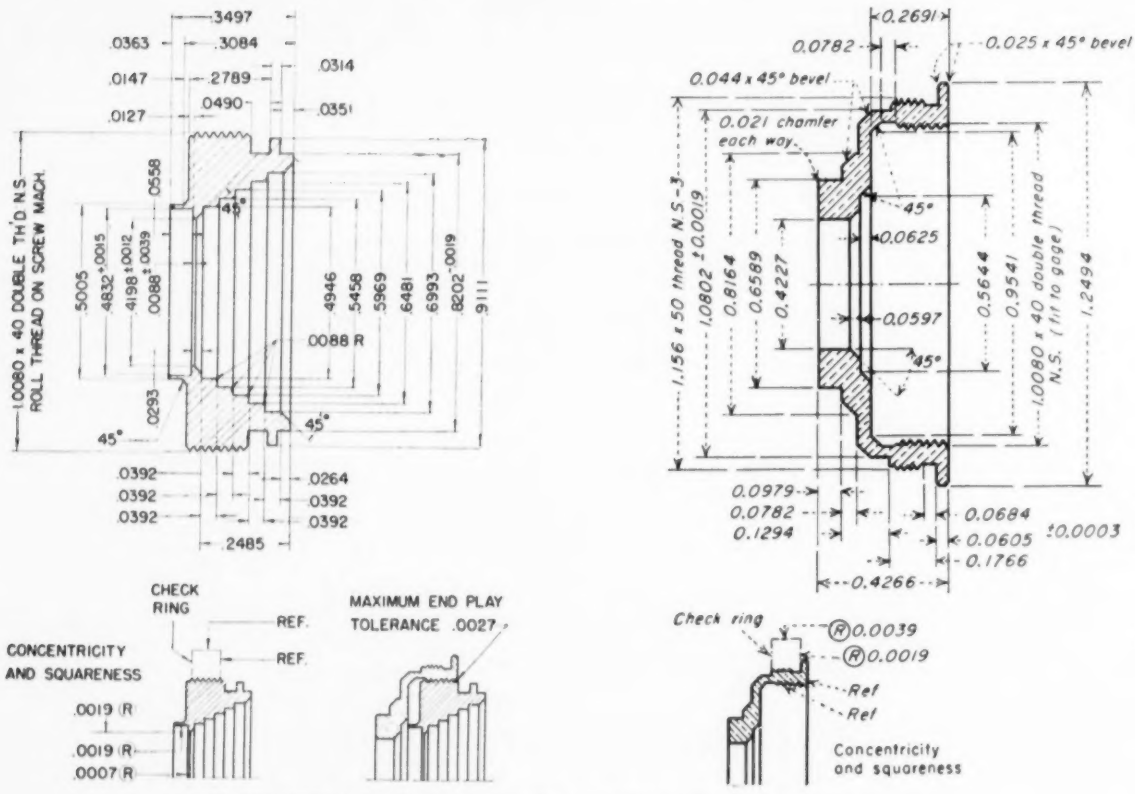
Current output is made to prescribed blueprint tolerances which permit interchangeability. Many of these tolerances are as close as 0.0004 in., with definite limits on squareness (max. 0.0007 in.), concentricity to 0.0019 in.), and minimum end-play, to conform to the mathematical requirements of the optical system.

Functionally, the external and internal threads control focusing and alignment of the optical system in completed assemblies, hence their performance must be mechanically perfect.

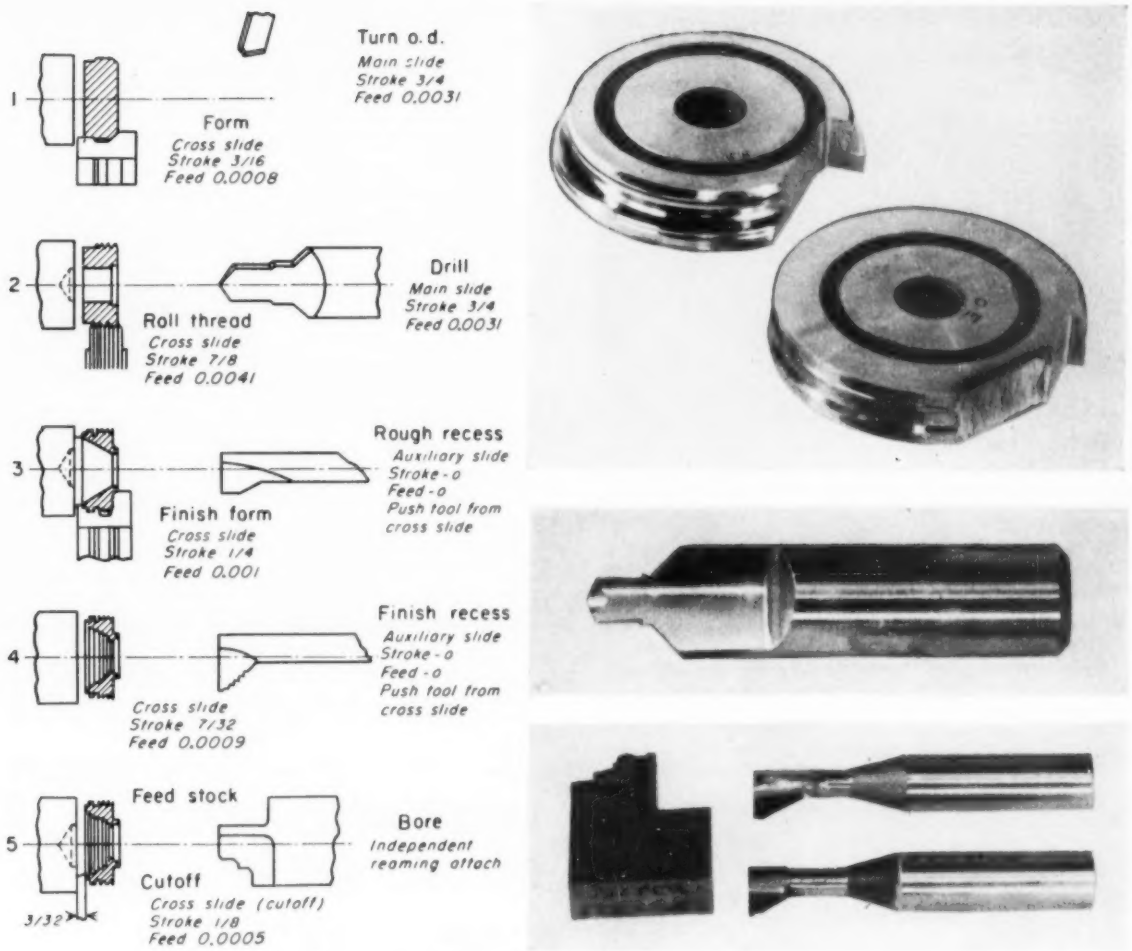
Running fits are not classified according to a commerical call-out of class 2, 3, or 4, but rather in terms of end-play between the mating parts, maximum 0.0027 in., taken from one side.

Usual production runs of optical threads are four-

THIS GROUP of nine 5-spindle Warner & Swasey automatics turn out filter mounts lens hoods, and elements for lens assemblies



RUN OF FRONT AND REAR LENS ELEMENTS shown here totaled 2000 pieces—was justified by short 12-hr setup time. Note tolerances for squareness, concentricity, and end play



COMPLETE SET of cutting tools for front lens mount includes (above, right, top to bottom roughing and finishing circular cutters for O D, drill, rough and finish recess tools (right), and boring tool (left). Schematic tool layout for front lens mount is shown above, left, top to bottom

start with, occasionally, 10 to 31-start threads. Close quality control checks the lead, taper, concentricity, drunkenness, and avoidance of burrs.

External threads up to four starts wherever possible, are rolled on the automatics with excellent results. This quality is attributed to the machines which provide close control of the turned diameter; thus, hold the pitch diameter within tolerance.

Internal threads are produced with split taps, ground one-thread chamfer, on the same machines with short engagements of 1½ to 2 threads. For blind tapping, maximum undercut is 1½ threads.

Eastman observes several factors in precision short-thread tapping of brass and aluminum:

1—Complete sensitivity while reversing the tap in the work because of relative tap-chamfer width to width of undercut.

2—Mandatory lead control, obtained with quadrant—setting mechanisms on all 5-spindle automatics.

3—Alignment of tap to workpiece. Taps are mounted solidly in a threading attachment specially fitted to the threading slide. This permits the axis of travel to be in perfect alignment with the axis of the work.

As an initial precaution, quality control of end play is observed by running two 5-spindle automatics simultaneously on tapping and thread rolling of mating parts. In addition, with one setup, the "thin-wall" parts are finished complete except for the cutoff ends. Formerly these same operations were performed on optical lathes, chasing the threads by hand to match the parts in pairs.

At Hawk-Eye, experience gained from multi-spindle automatics has decided designers to complete the job on a single machine, by redesigning the parts and combining appropriate tooling. Although original tool cost is high, this procedure has proved itself with yields as high as 95%.

Carbide tools are used where accurate turning,

PRESCRIBED TOLERANCES on the blueprint permit interchangeability of mating parts and insure exact nesting of the lenses when spun into place. Surface finishes of 32 mu in. rms are produced by machining alone, eliminating secondary buffing and polishing

boring, and surface finishes are required, otherwise high-speed steel is adequate.

Spindle speeds on the automatic are at their highest practicable range. The main tool slide, for internal surfaces, has ¾-in. stroke and 0.0031-in. feed.

Sequence of operations for the front brass mount, stock 1 1/16-in.-dia rod:

1—Main tool slide—turn O D.
Cross-slide—rough form O D.
Stroke 3/16 in., feed 0.0008 in.

2—Step drill, roll ext thread. Feed 0.0041 ipr.

3—Form thread recess—finish O D. Auxiliary slide—rough-form internal recess. Stroke and feed at zero.

4—Auxiliary slide—finish-form internal recess. Stroke: cross-slide 7/32 in., feed 0.0009 in.

5—Independent reaming attachment—finish-bore lens seat. Angled form tool—chamfer outside and inside (no burr).
Cross-slide, cutoff. Stroke ⅛ in., feed 0.005 in.

Cycle time 16.8 sec

Sequence of operations for brass rear mount, stock 1¼-in-dia rod:

1—Rough drill.
Rough form O D. Cross-slide stroke 3/16 in., feed 0.0008 in.

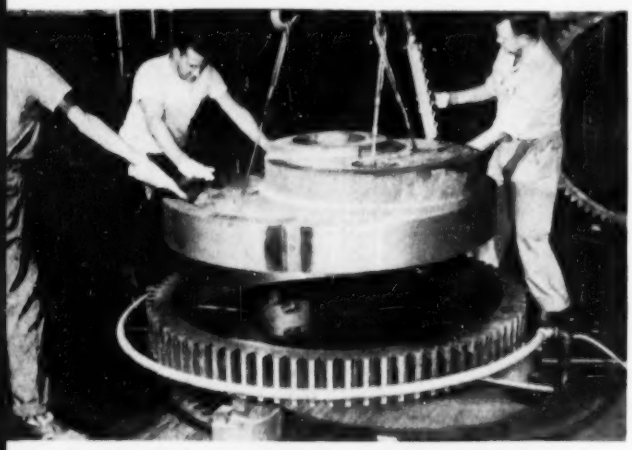
2—Finish drill.
Roll external thread cross-slide stroke ⅞ in., feed 0.0036 in.

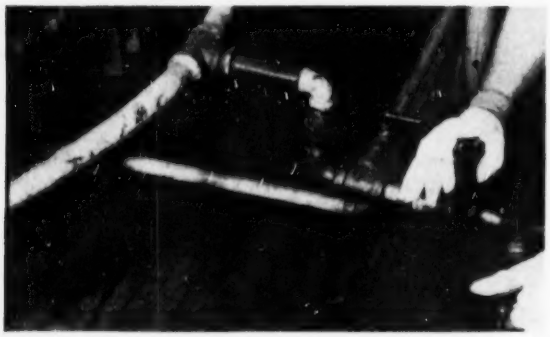
3—Form-thread relief. Cross-slide stroke 3/16 in., feed 0.008 in.

4—Tap and finish-form O D. Aux and cross slide.

5—Cross-slide, cutoff. Stroke ⅛ in. feed 0.005 in.

Time cycle 16.8 sec





RAILROAD WRINKLE SHRINKS RING GEARS ONTO HUBS

BY NELS CARLSTROM, Supt.
BRAD FOOTE GEAR WORKS, INC

The reason for this odd setup in a corner of our plant was lack of a furnace big enough to hold the gears, which were 65½ in. on the OD, 57.245 in. on the ID, and had 8-in.-wide faces. To avoid any delay in sending them to another plant for assembly, we rigged a simple gas-heating unit. It's a steal from RR backshops, where they shrink tires onto wheels the same way.

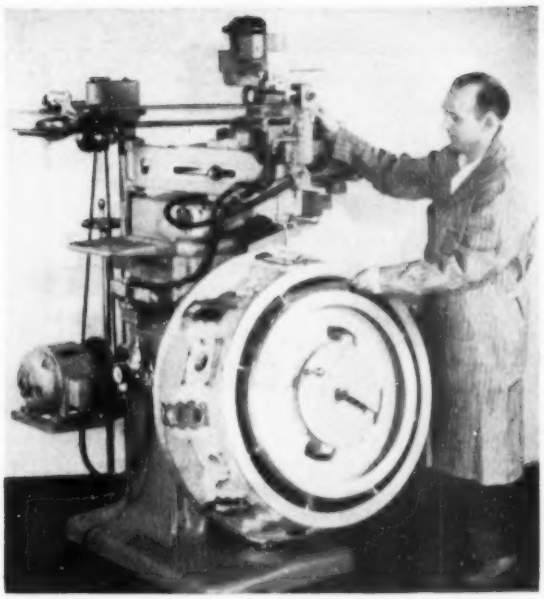
The ring is 1¼-in. steel pipe bent to form a 72-in. circle with 1/16-in. holes drilled radially on 1-in. spacings around the inside. Fittings to admit city gas and compressed air were located opposite each other on the ring to spread flames evenly. There is 3 in. of clearance all around between the ring and gear, so each ring is heated about 15 min to expand it 0.10 in. on the diameter. The steel hub casting is inserted, and the assembly is allowed to cool.

OD of the hub is 57.269 in., so a tight joint is formed as the gear cools. This railroad method works faster and easier than conventional heating, and the operation is less costly.

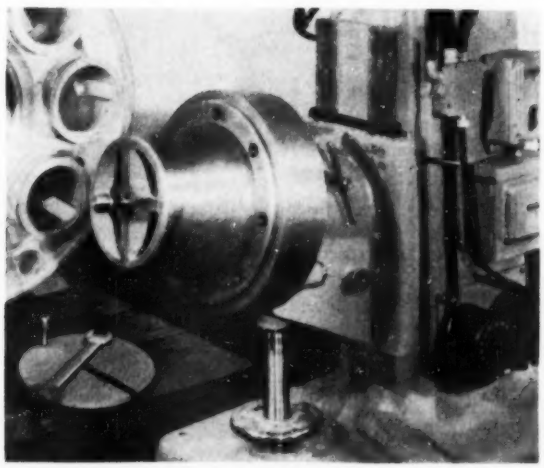
SETUP is a gas-pipe ring, inside which the ring gear rests on three metal blocks. Hub is hoisted over gear, ready for positioning. Assembly is made after city gas and compressed air have heated ring to expand it; hub is placed inside ring and left there until ring cools

Semi-automatic pantographing simplifies ring slotting

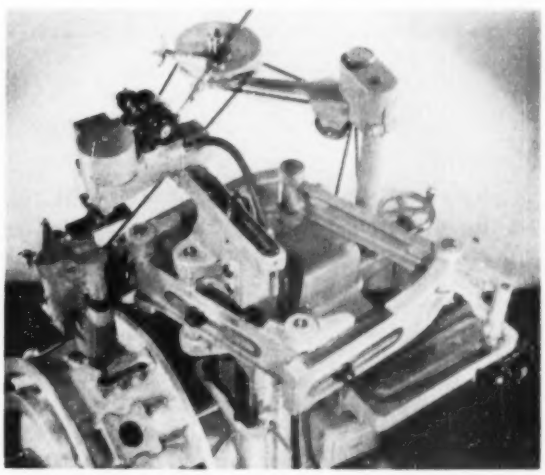
Automatic cutter feed and guiding, with hand indexing between cuts, produces eight slots to tolerance in aluminum-alloy casting in 24½ min, floor to floor



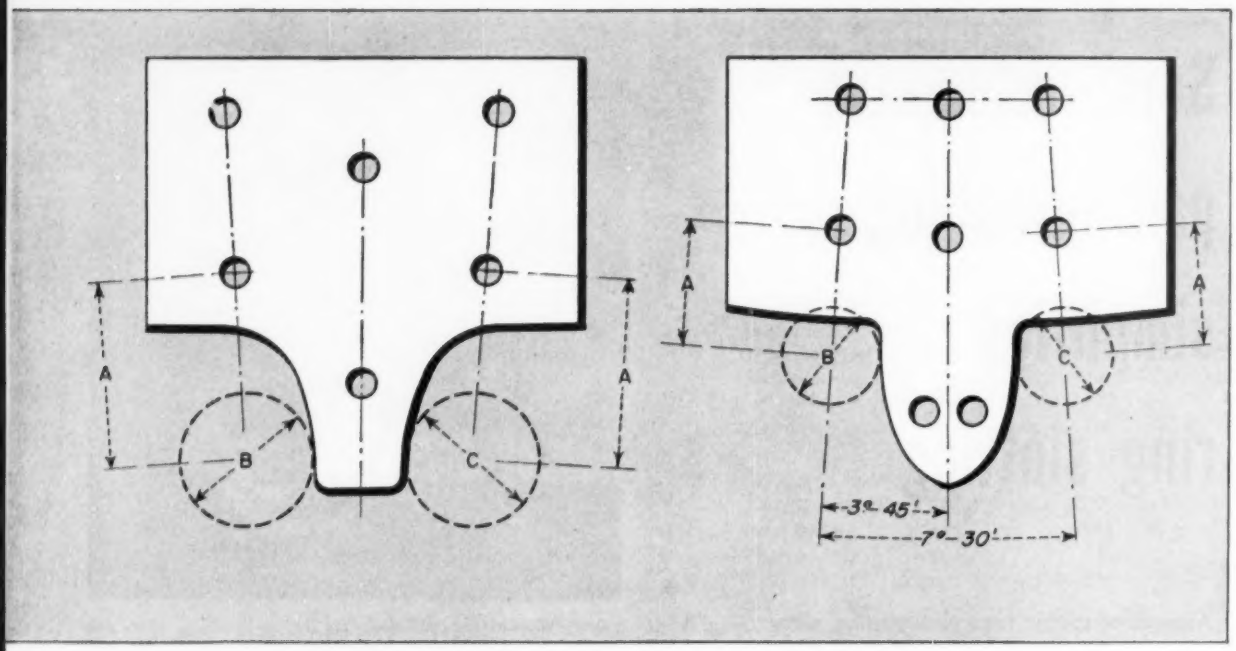
EIGHT ELONGATED PORTS were required in a 37¾ x 12-in. ring casting of aluminum alloy. Ports had a ⅞-in. radius at one end, blended ⅝- and ⅞-in radii at the other. One maker set up the piece on a mandrel, drilled end holes, then milled the slot—a slow and expensive manual operation that tied up a big machine tool and resulted in many slots out of tolerance. Another maker used a special fixture on a vertical mill and followed scribed lines manually—again slow and hard to hold in tolerance. The third maker originally planned a vertical-mill setup with tracer following a 1 to 1 master under manual control—again slow. This was the solution—a heavy-duty Gorton P-32 2-dimensional pantograph miller with a stub-mandrel fixture replacing the usual table, knee, and saddle



THIS SPECIAL INDEXING FIXTURE is adjusted vertically during setup by the standard knee-elevating screw. Work is held on it by the slotted plate at left. When start button is pushed, the cutter comes down automatically, feeds down while a motorized master traces the shape. Cutter is retracted just far enough to clear for manual indexing to next pin location. Floor-to-floor time is 24½ min, or about 3 min per slot, much less than by alternate methods. Space is saved, the operator can handle several machines, cutter cost is lowered, coolant is used to lengthen tool life, finish is better because of higher spindle speeds, and close tolerances can be held because of the pantographic reduction



SPINDLE HOUSING AND PANTOGRAPH assembly are standard, with additions. A special pneumatic unit is built into the top of the spindle assembly to rapid-traverse the cutter to the work at the start of the cycle, away at the end. A cam-fed downfeed assembly above the cutter spindle feeds the cutter down during profiling (center left). Downfeed is controlled by a Variac to provide required finish and cutter life. The tracing stylus (far right) is attached to an endless chain which drives it at a speed depending on setting of a Variac on the drive motor. Tracer reduction is 3 to 1



HOW TO MAKE INVOLUTE DIE TEMPLETS

Master involute gears present a special problem to shops not accustomed to this work, but gears are rather simple compared with making a die that will blank and shave parts having involute teeth. Here is how we did it

By DAVID T WORTH, Tool Engineer,
SOUTH PARK TOOL AND MOLD CO, INC, Dayton, Ohio

To grind master involute gears, a sideline of our firm, we use two fixtures. One fixture generates the form by rolling the gear and grinding the tooth-space, using a wheel which has the pressure angle dressed on both of its sides. This fixture is used to grind gears having an undercut below the base radius. The second fixture dresses the involute form into the wheel which, in turn, is used to form-grind the gear shape.

While these fixtures work very well for gear grinding, manufacture of a die to blank and shave involute teeth requires a different technique. We set the job on a surface grinder equipped with a Moore Panto-Crush attachment. This attachment utilizes a 10 to 1 pantograph linkage and a templet. A tracer point transfers the templet form to the diamond which dresses the wheel. Until recently, we used our generating fixture to produce a templet, which then was used on the Panto-Crush dresser. This templet had to be ten times the size of the actual tooth form. A templet of this size is awkward to construct, particularly when the form to be ground has a large pitch radius. For example, an actual pitch radius of 4.00 in. requires a pitch roll of 40.00 in. for use on the generating fixture. Hence we decided to use a different templet-making method.

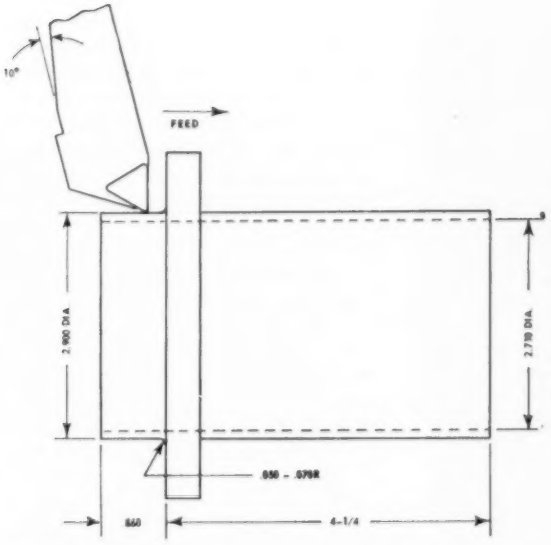
We received an order to produce five sets of dies, each set to include a blanking die and a shaving die for the involute form. The gear teeth were modified at the tips as shown.

For the die templet, we bored, in solid gage stock, a series of holes relative to the centerline of the tooth space. Into another piece of stock, we bored a series of holes relative to the centerline of the actual tooth. The latter templet was for the punch. Boring was done after we determined from the jig-borer operator that he could move the cutting tool out from the spindle center any given distance within an accuracy of ±0.0005 in. Then a layout was made which showed the location of these holes and the

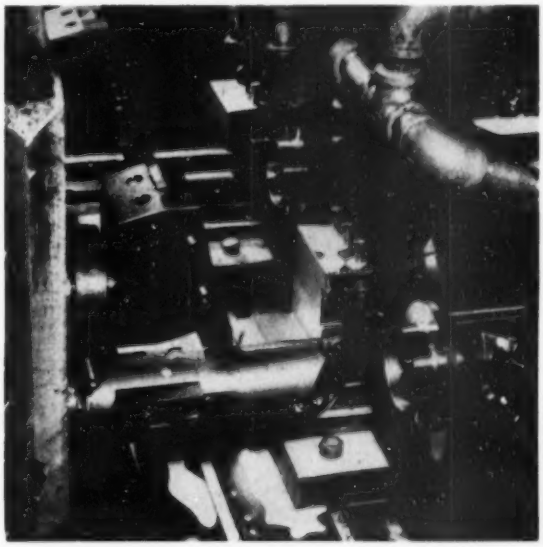
size. 35 holes were bored for the die templet and 21 holes for the punch templet. After boring, the excess stock was machined away, and the tooth modification was introduced by another bore or swinging the radii. Scallops left on the tooth form were carefully ground and stoned away. The formulas used to lay out the templets were derived from Earl Buckingham's book *Spur Gears*.

Punch grinding was done in the same way. As the dies were compound, the shedder teeth were ground from the punch templet and the diamond was set on the tracer attachment to permit the shedder a good slip-fit between the die-blocks. All of the figures on the templets were set up to allow for clearance between the punch and die, backlash on the teeth, and die wear.

Formerly the punch was ground either by generating or by dressing the form into a wheel with a generating fixture. Now the punches are ground to a templet which has a definite form and allows the wheel to be dressed with no variations between dressings. Producing a die templet by the old method required a minimum of 30 hr, while the punch templet called for an additional 10 hr. Now we make a templet in six hr regardless of whether it is for punch or die and accuracy is at least as good. All of the gears produced were within a tolerance of ±0.0002 in., which was more than satisfactory for this job.



STANDARD KENNAMATIC HOLDER was modified by milling side of shank at 10° to permit cut to shoulder



INSERT TOOLS in knee holders reduced downtime required for changing tools in turning jet engine cylinder barrels

CARBIDE INSERT CUTS TOOL COST ON JET CYLINDER BARRELS

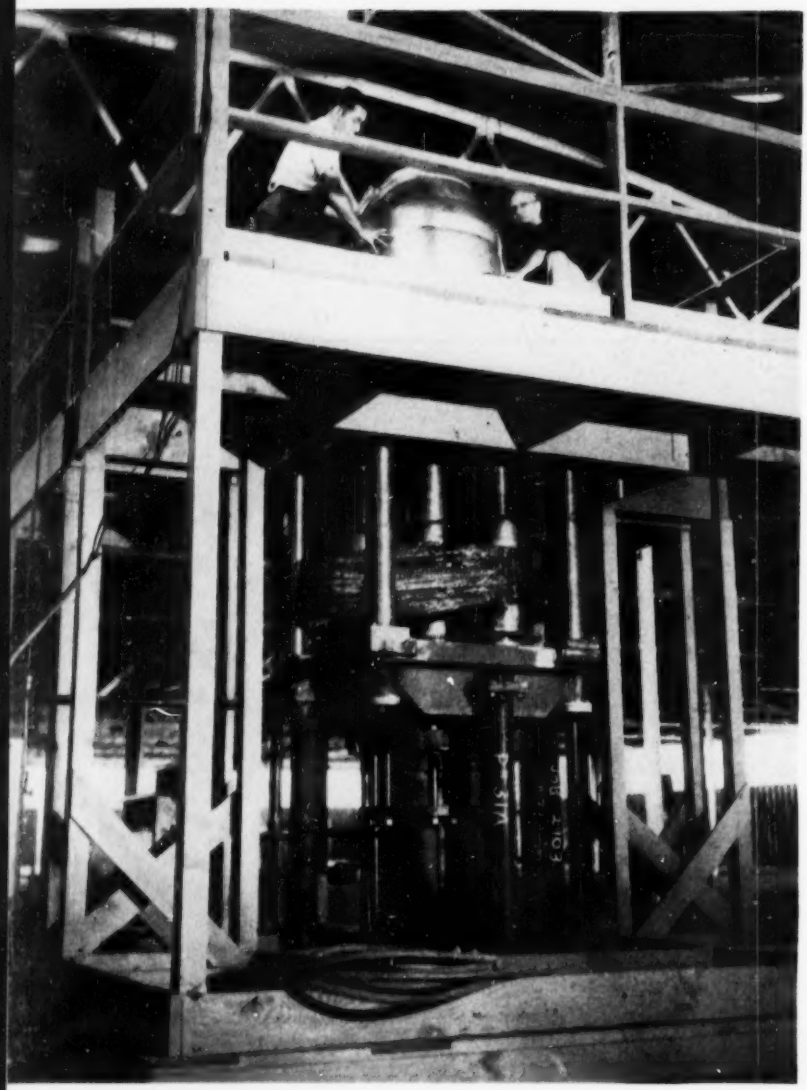
Both tool cost and machine downtime have been reduced in machining forged steel cylinder barrels (AMS 6382) at the Fairchild Engine Div of Fairchild Engine and Airplane Corp, Farmingdale, NY. This was accomplished by changing from a brazed carbide tool to a triangular insert.

Tools for rough and finish turning are held in knee attachments on a No. 502 Potter & Johnston 2-spindle automatic. Because the tools are held at a 25° angle the standard holder had to be milled at a 10° angle. In conjunction with the 15° lead angle, this permits cutting to a square shoulder.

Two standard Kennamatic style TBR-16 tools, grade K2S for roughing and K4H for finishing, turn 100 pieces per cutting edge in roughing and 140 in finishing. The triangular inserts have three indexable cutting edges on each end, so tool life per grind is 600 and 840 pieces for roughing and finishing. This compares with 20 and 25 pieces for roughing and finishing, respectively, for brazed carbide.

Total tool life of the brazed tool was 400 to 500 pieces—about 1¢ per piece. Spreading the cost of the holder over five inserts of about 7000 pieces each, tool cost with the insert tool is about 1/13¢.

LARGEST EXPANDING MANDREL

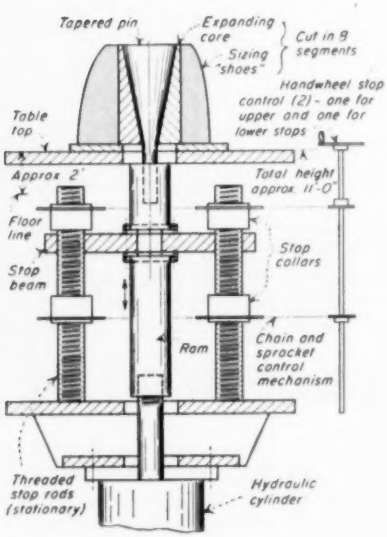


4800-TON EXPANDING MANDREL, not yet installed in below-floor pit, is in operation forming large stainless steel jet-engine parts of coned and contoured shapes. Scaffolding provides temporary access to working head and controls

A special machine for a special job is Ryan's answer to the problem of contouring oversize aluminum and stainless cylinders to airfoil and other shapes. There were two other answers—pressing and spinning—but this one, exemplified by three machines of ascending capacities, proved quickest, simplest, and most economical

BIG external fuel tanks for Air Force planes were the first product worked on by a set of special forming machines installed at Ryan Aeronautical Co's San Diego plant. The components are tubular sections of diameters to over 4 ft, and with partial airfoil contours along their longitudinal axis. The rough cylinders are formed fairly easily by welding up rolled sheet sections to make tubes with parallel walls. But the contouring necessary to produce an airfoil shape in the final fuel tank involves curves in two directions.

Ryan approached the problem from the standpoint of an internal expanding collet, depending on expansion of the shoes of the



TAPERED PIN IS PULLED DOWN by 18½-in.-bore cylinder working on 5000-psi pressure. Eight nickel-iron segments expand eight formed aluminum shoes that bulge and form the work. Total weight of unit is 17 tons, including 1000 lb of weld metal used in fabrication

BULGES AIRCRAFT FUEL TANKS

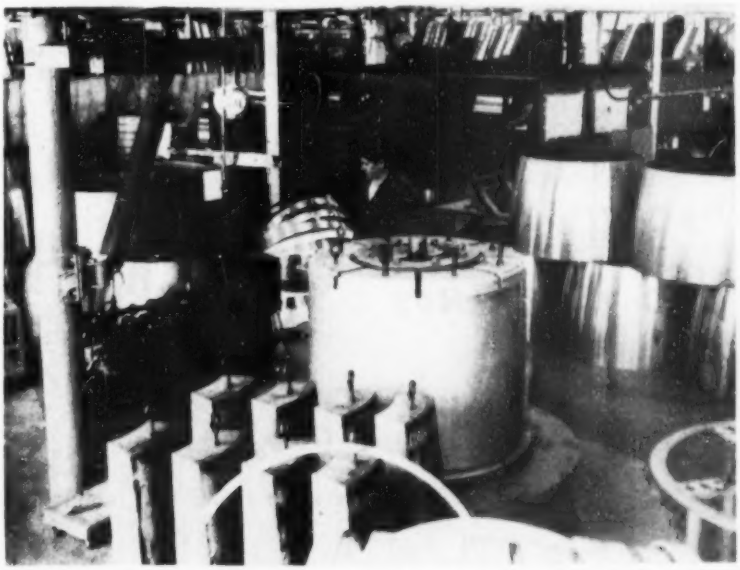
machine to bulge each tube to the proper contour. Actually, expanding mandrels working on the same principle have been used for some time in aircraft and other shops, so the main problem was designing and building a unit to the large size necessary.

The first unit, with capacity up to 568 tons, was designed and built by Ryan and National Steel & Shipbuilding Corp, San Diego. The machine worked, forming contours without thinning the metal or producing any "oil-can" effect which sometimes crops up in hammer forming. The process has been found to be economical of material and reliable in making a number of units to the same size and shape.

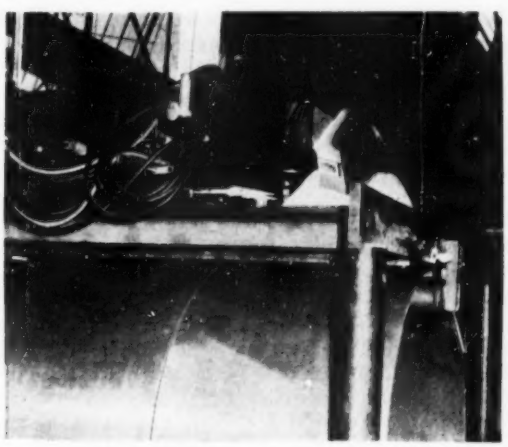
The second machine was built for capacities up to 1200 tons, and it worked well enough to be adapted for parts other than fuel-tank sections, including some jet-engine parts made from stainless steel.

The latest in the line, which was made by Waldrip Engineering Co, Hollydale, Calif, is the largest such machine in the world, and rates a capacity of 4800 tons. The unit, like the others, is fitted with eight aluminum shoes for each different forming job required. In addition to power, the equipment has precision, being adjustable to 0.005-in. accuracy on the OD of the shoes. Four adjustable steel collars are threaded on steel columns to limit motion of the main shaft. This limits action on the hydraulic piston, and is controlled by handwheels that operate chain-driven sprocket under the working head.

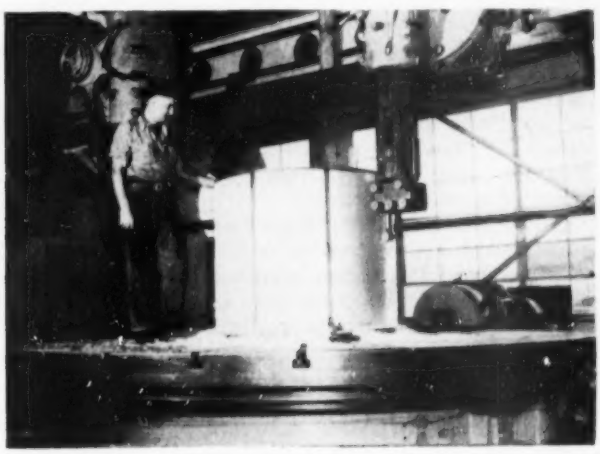
Most experience, so far, has been with aluminum; skins in the SO or SW condition are formed, then heat-treated afterward. Experimental work with various alloys of stainless indicates that the power of the bulging mandrel will allow forming stainless parts of the same size as those made in aluminum.



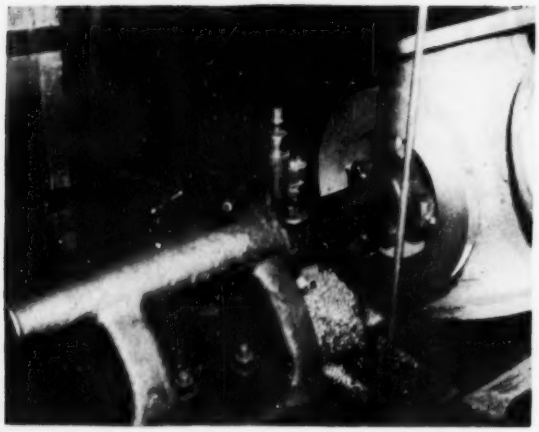
SMALLER EXPANDING MANDREL (1200-ton capacity) in shop expand-forms large aluminum sections of external fuel tanks. Stock in place over mandrel is all welded, ready for forming. Main part of unit is installed below floor level



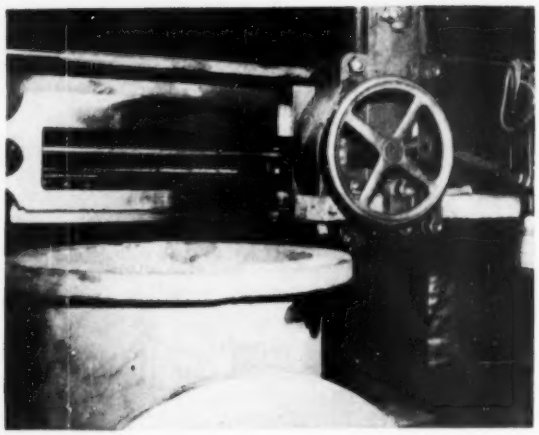
WORK IS HELIARC-WELDED TOGETHER to contruct cylinder, using flat stock rolled to curves required. Welding unit requires no control except for starting; feeds filler wire automatically and controls voltage



CONSTRUCTION OF MANDREL included machining eight segments of expanding head on large vertical-spindle boring machine. Segments were finished, then shoes added for various jobs—each set of shoes to produce a different final form on the work



MECHANICALLY HELD "soft" carbide used to advantage on old lathe which lacked rigidity. Greater tool life more than offset the retooling cost



"SOFT" CARBIDE performing on 73-year-old, flat-belt-driven boring mill. Tool life was improved 100%, saving costly downtime

"SOFT" CARBIDE + OLD MACHINES = HIGHER PRODUCTIVITY

Even old machine tools can produce more, with the addition of "soft" carbide tools. Resistance to shock and ease of grinding make this carbide grade the "payoff" for old machines where the thought of tooling with carbides would be sheer madness

BY PATRICK H GRIBBIN, Engineer
KENNAMETAL, INC, Latrobe, Pa

New machining possibilities have been opened during the last year with "soft" carbide—R_A 90 previously used for years in planing. On old machine tools, reports indicated greater production, reduction of original tooling cost and maintenance, ease of workpiece duplication, and lessened downtime. "Soft" carbides offer a speed-and-feed range above that obtainable with hss tooling—but not as high as accepted carbide practice.

This softer cutting material offers an opportunity to new or inexperienced users to become familiar with carbides. Production advantages can be tooled into older equipment by its application, for planing, boring, and turning operations, because of its ability to withstand shock.

Soft carbide (grade K1) is suited for machining of workpieces containing inclusions, difficult interruptions, and lack of rigidity. Being the softest of carbides, it can be used successfully from 80 to 125 sfpm with feeds up to 0.062 ipr or stroke. Decreased tool wear, with less downtime, permits the workpiece to be machined with higher speeds and feeds, resulting in a reduction of over-all machining time.

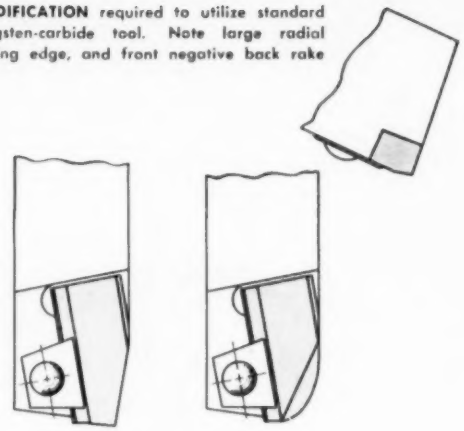
Radial cutting edges on the carbide tools give better performance on old machines because they permit the tool to work gradually into full rigidity. The same thing occurs as the tool is cutting out of the workpiece, when break-through of the tool results in carbide fractures from builtup pressure caused by backlash, and lack of rigidity.

A typical example of increased productivity was obtained in one shop where the cutting tools for planing of steel liner plates was changed from hss to clamped-on-tip tungsten carbide. These tools planed 9/16-in.-deep by 1⅛-in.-wide offsets on the sides of six 32-in.-long workpieces lined end-to-end on the table. The machine was a 50-yr-old manually fed planer having a top speed of 40 sfpm.

With the previous tools, operating at 40 sfpm and 1/64-in. feed, it required 40 min. to plane the offset on only one side of six liner plates.

This same operation has since been handled successfully with standard "soft" carbide planer tools in 7 min., operating at 40 sfpm and 3/32-in. feed.

MODIFICATION required to utilize standard tungsten-carbide tool. Note large radial cutting edge, and front negative back rake

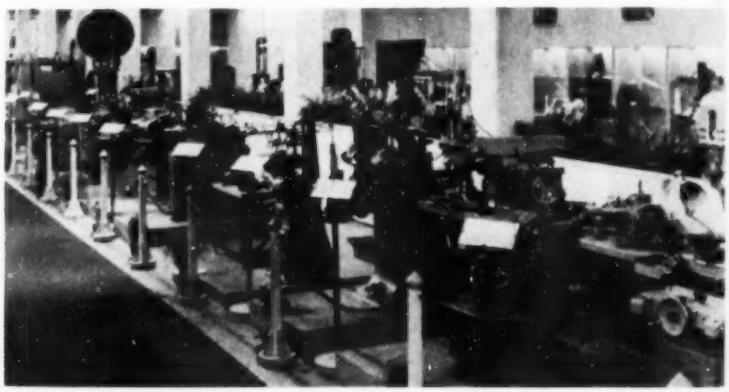


Because the old planer was not equipped with tool lifters, 14-in. hinges were clamped under the cutting tools for the return stroke. Combination of a general tightening of this old machine and application of the soft carbide (grade K1) gave the equipment its needed shot in the arm.

As another example, a western Pennsylvania foundry is currently doing a good job of facing flanges on large cast-iron pipe fittings with mechanically held soft tungsten-carbide tools despite the 74-year-old age of its Sellers belt-driven boring mill. Using a 0.040-in. feed at 130 sfpm they machine a depth of ¼-in. on a 4-in. face. A standard mechanically held tool with grade K1 carbide is used with a 6° negative angle adjacent to the tip's cutting edge.

Success gained through the aforementioned tooling procedure points toward the possibility of applying harder grades of carbide which normally should result in an additional gain in surface feet per minute, by providing a slight adjustment of gibs or general tightening of the machine tool.

Results obtained with "soft" carbide indicate a greater saving may be realized. It offers a reduction in tool maintenance, less grinding equipment, fewer operators, the equivalent of several tools-in-one, radial cutting edges affording greater strength, ease of entering and leaving cut, lower tool inventories, and decreased purchase costs through standardization.



THIS SECTION OF EAST GERMANY'S SHANGHAI MACHINE TOOL EXHIBIT consisted largely of machines not yet made in China—internal honers, lead screw lathes, etc

CHINESE PEASANTS EXAMINE A GERMAN DIESEL TRACTOR on display at Peking this spring and summer

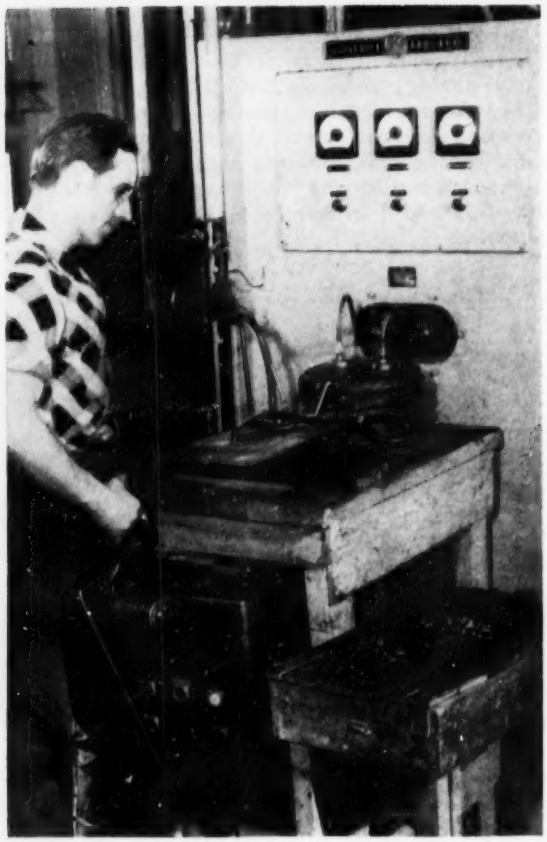
SOVIETS STAGE MACHINE TOOL SHOW IN CHINA BY DAVID SCOTT

East German industry staged its biggest foreign display yet, in Communist China earlier this year. Some 900 tons of engineering products and consumer goods were shipped to China last winter, and the exhibition opened in Peking on April 27, occupying an area of 75,000 sq ft. East German products on show included machine tools, precision and optical instruments, heavy electrical equipment, farm machinery, vehicles, textile, and printing machinery. Attendance was said to exceed 750,000.

After a month, the show moved on to Shanghai, where it ran for another four weeks. East German aims were to familiarize the Chinese with their equipment, while sizing up China's existing production facilities and future machinery requirements.

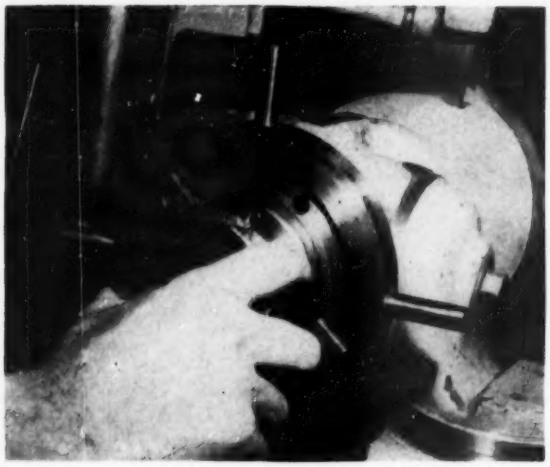
Another purpose took the form of pointed overtures to the West Germans at the Leipzig Fair in September, when it was emphasized that there was more than enough business in China for both parts of Germany. China was reported to be currently engaged in building 400 industrial plants, and officials stated that although the recent agreement with East Germany provided for a one-third increase in exchanges over 1952, the potential demand for capital equipment could not be met by the east zone alone.

talented tooling



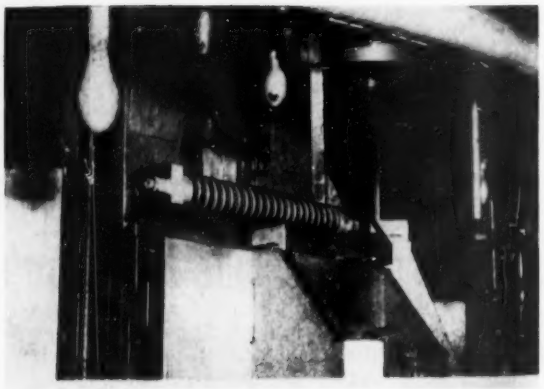
INDUCTION HARDENING MAKES WRENCHES LAST 10 TIMES AS LONG

Air jet cools wrenches and cutting pliers that are induction-hardened at this General Electric 20-kw heater. Working surfaces of the tools are hardened for wearability without changing internal structure of the steel, which provides toughness. One operator hardens 350 wrenches per hr. *Utica Drop Forge & Tool Corp.*



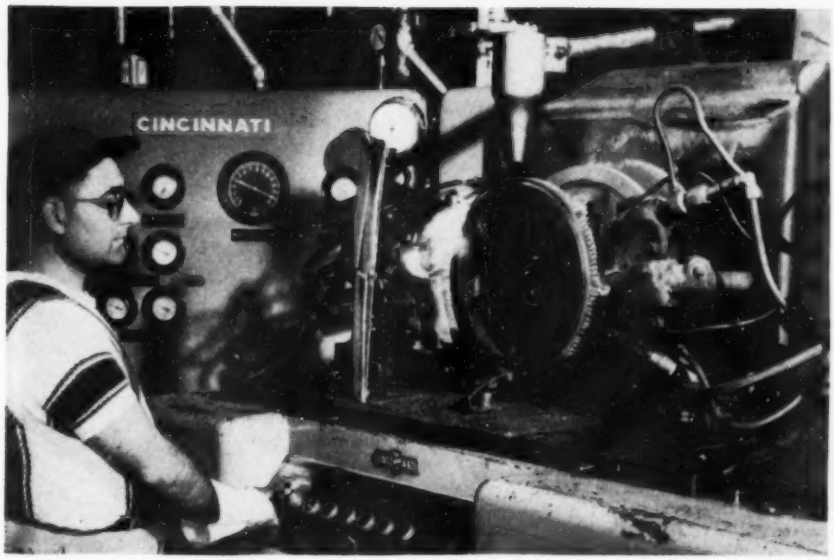
GRINDER ATTACHMENT PUTS HELIX ANGLE ON CUTTERS

Carbide spar-mill cutter tips are ground with a helix-angle facing instead of a normal flat facing on a Cincinnati No. 2 cutter grinder because of a special attachment added to the setup. The helix-ground face provides constant rake angle in relation to the cutter centerline; and results in more cutter efficiency, less frequent grinding, and an estimated 20% increase in tip life. Guide wheel attached to workhead spindle has four spokes which slide along an adjustable guide or straightedge as the work is fed into the diamond grinding wheel. This makes work spiral through helix angle. Once helix is formed, resharpening the tips is easy. *Temco Aircraft Corp.*



SPRING CUSHIONS INTERRUPTED CUT ON BULLARD

The crossfeed toolblock is fastened to the stationary ways of a Mult-Au-Matic by a heavy tension coil spring. This corrects a situation that sometimes crops up when heavy interrupted cuts are being made—wherein the cutter chatters and produces a poor finish. The same kind of rig is helpful when the material being cut is excessively thick or hard, or has soft and hard spots or inclusions. The spring prevents the chatter from being transmitted from the cutter to the crossfeed mechanism. *Cadillac Motor Car Div, GMC (Cleveland Tank Plant).*



WHIRLING FIXTURE EQUALIZES FLAME HARDENING

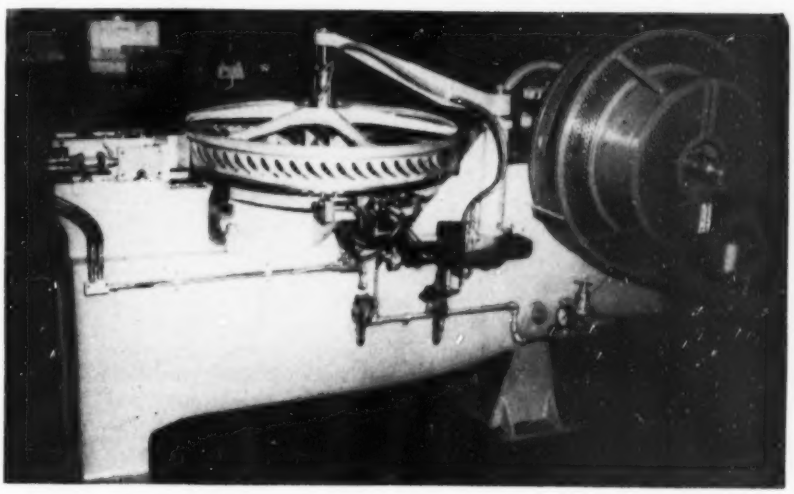
Flywheel ring gears are hardened on a Cincinnati Flamatic equipped with a special rotating fixture that insures equal treatment for all gear teeth. Hardening is done with propane gas, and is gaged to penetrate only to the bottom of the teeth, which prevents cracking or bending the entire ring. *Buick Motor Div, General Motors Corp.*

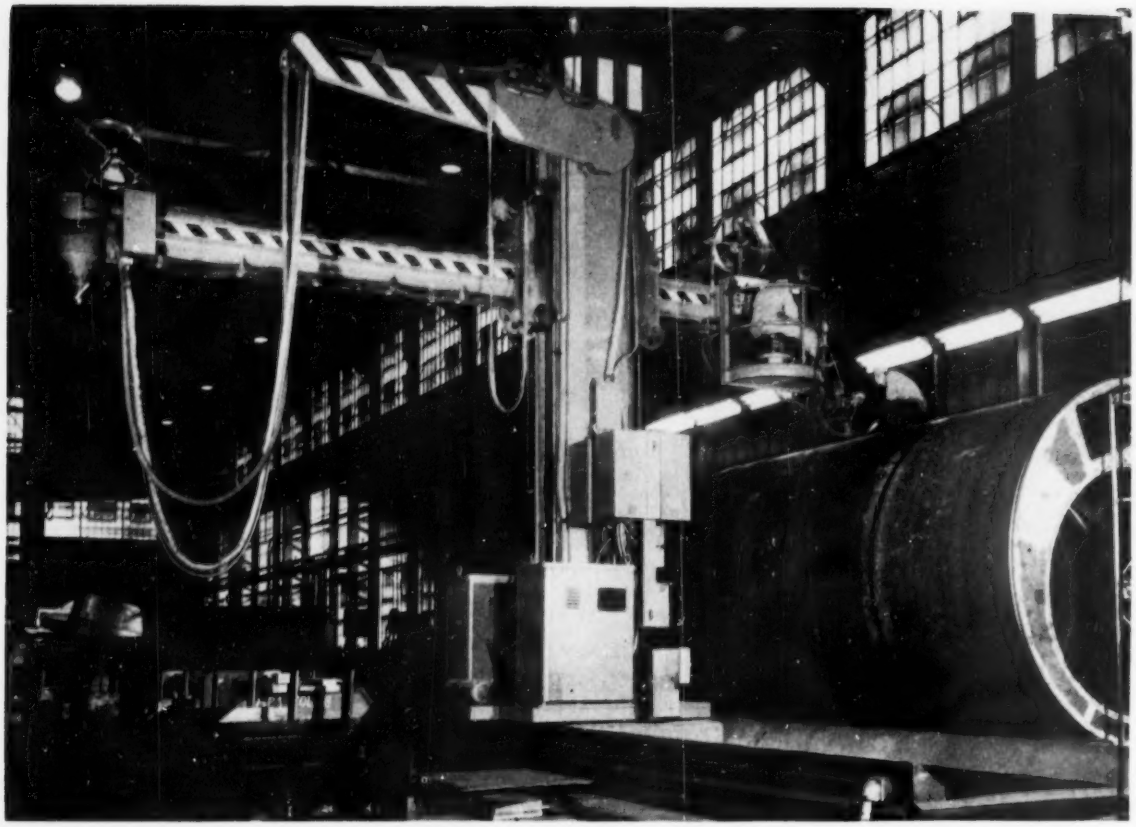
EXTRUSION SCREW WITH CHANGE OF LEAD CUT ON LATHE

1400-lb alloy-steel screw, 95 in. long and 8½ in. in dia, was normalized several times during machining to relieve stresses set up by tools. Two problems in turning were maintaining smooth finish and changing lead and depth of cut along screw length. Finished screw, hardened to maintain life and prevent plastic material from sticking, is being checked for surface smoothness by micro-finish gage. *Western Electric Co.*

SPECIAL HORIZONTAL PRESS PIERCES JET-ENGINE VANE RINGS

Slots for airfoil-shape blades are punched horizontally in a 32-ton press that will operate automatically. Two slides are provided for working the punch strokes outside-in or inside-out. Time for piercing 64 slots in the 32-in. stainless-steel ring is 40 sec. The press has an air clutch, special indexing fixture, and automatic air-operated hold-down clamp that grips the work. Horizontal action makes work clamping easier, simplifies loading, and improves stability of workholding devices. *V & O Press Co.*





LARGE RADIAL-ARM UNIVERSAL POSITIONER for submerged-melt welding head permits economic welding of large assemblies without need for expensive fixtures. Operator on platform above 40-ton generator frame has full control of all movements of positioner

Universal Welder Reduces Welding Costs

Fixtures are eliminated by radial-arm head mounting arrangement, so submerged-melt welding becomes practicable on low-activity assemblies

Submerged-melt welding, in which arc welding is done under a blanket of granular fusible material, generally has been considered economically impracticable for low-activity fabrication of weldments. Either excessive fixturing is required to insure proper positioning of the welds or, if no fixtures are used, the setup time is so much greater than total manual welding time that nothing is gained. Most plants, therefore, have confined their applications of the submerged-melt process to high-activity production welding.

Two years of experience in using a specially developed universal head positioner at the East Pittsburgh Works of Westinghouse Electric Corp have shown us that we have a satisfactory answer to this problem. Resembling a large radial drillpress, this positioner permits economical submerged-melt welding of low-activity assemblies weighing as much as 75 tons.

A wide variety of parts can be welded under automatic control with this unit. Large bedplates fabricated from rolled beam sections, heavy fabricated beams, bearing pedestals, motor and generator frames, end frames for rotary condensers, and many other large-size units have been welded at lower cost than is possible with conventional manual arc-welding procedures.

The fabricated frame for a turbine-driven generator, shown above, weighs approx 40 tons. Welds on frames of this type consist of one or more longitudinal seams averaging 20 ft long in 1-in. steel plate, two longitudinal fillet welds approx 18 ft long on the main frame supports, and three or more

12-ft-dia girth seams in 1-in. plate.

Designs of all these parts are subject to change at any time, to suit customers' requirements. This factor alone limits the use of expensive fixtures. The fact that the parts are large and heavy also complicates the fixture problem and adds to production cost.

All these factors were considered when the universal head positioner was designed. It permits the use of universal welding positioners, horizontal turning rolls, and other work locators whose cost can be amortized over a wide range of product type and size.

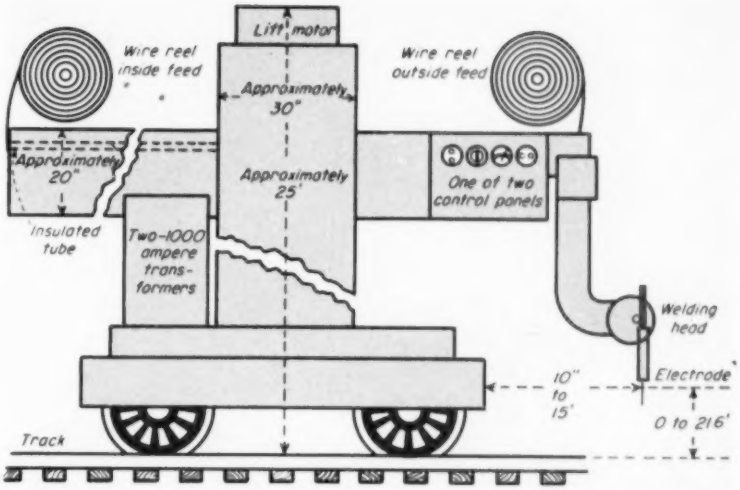
The center column is mounted on a fabricated truck that can be moved in either direction along a 90-ft track at 6 to 120 ipm. Mounted through a center slot in the column is a long horizontal boom that can be moved in either direction at 6 to 120 ipm up to 15 ft in either direction, and can be moved vertically up to 21.6 ft from the floor. The column can be rotated to swing the boom horizontally 359° in either direction at 6 to 120 ipm.

Control System

Two identical control panels are provided, one on the boom and one near the base of the column. The master panel is on the boom; when it is in use, the panel on the column cannot be operated until the operator at the boom panel returns control to the column by turning a drum switch. All movements, as well as welding current and voltage, are controlled from either panel. Each type of motion has a separate tachometer, speed being read directly in inches per min.

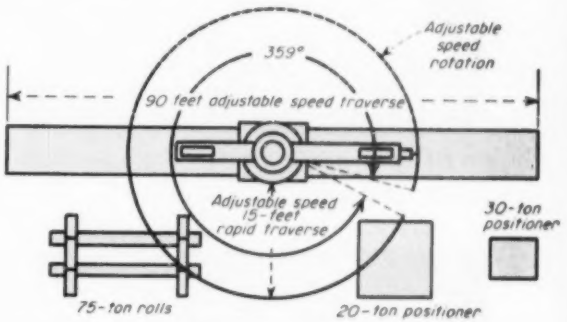
When welding is to be done with the boom in an elevated position, an operator's platform is attached beside the welding head. Design of the boom and its supports provides good stability even when the boom is extended full length. A rivet-locating light that produces a spot of light approx 3/16 in. in dia is mounted on the head to trace the line of weld being made. Because head controls are both sensitive and accurate, the operator can follow a weld line closely without need for close lineup of the weldment with a preset head traverse path.

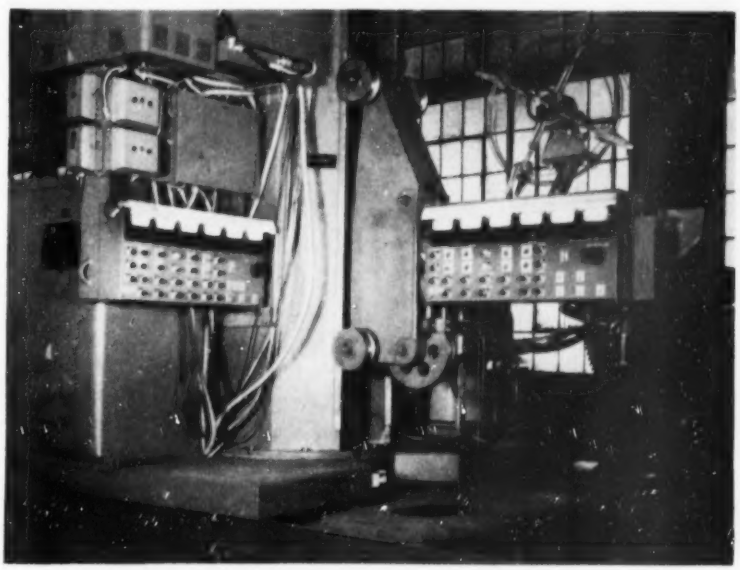
Two welding-wire reels are



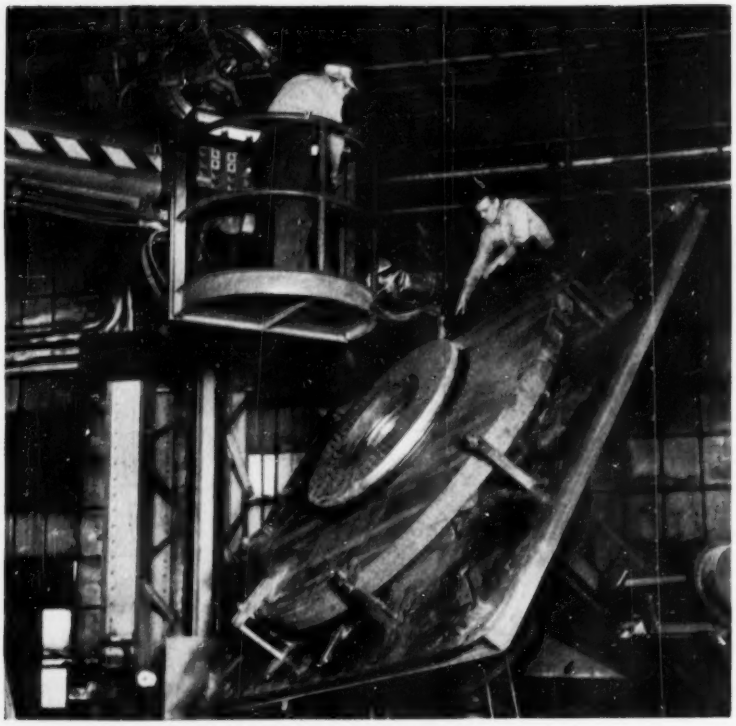
TRUCK SUPPORTING CENTER COLUMN of Westinghouse-designed welding head positioner moves along 90-ft track at infinitely-adjustable speed ranging from 6 to 120 ipm. Boom is movable 15 ft horizontally and can be swung through 359° arc by turning center column

ALL MOVEMENTS OF WELDING HEAD on end of boom can be controlled from pushbuttons on ram or on column. Heads can be interchanged to suit type of automatic welding operation to be performed. Auxiliary equipment cuts job setup time





DUPLICATE CONTROL PANELS are provided on end of boom and at base of column. Tachometer dials above pushbuttons show rate of traverse of all movements, including table of adjacent 20-ton universal welding positioner, in ipm. In this view, boom is fully lowered and retracted, and operator's platform removed



HUB PLATES are welded to large flywheel disks in this setup on 20-ton capacity welding positioner beside the radial-arm head positioner. Operator on platform supported from end of positioner boom and helper on table of work positioner easily control head

SMALLER HEAD POSITIONER is provided to weld assemblies held on small (3-ton capacity) positioners, with head controlled from floor level. Automatic arc welding head has been substituted for submerged-melt head in this setup. Ram is fully adjustable

mounted on the boom. The one at the front end, near the welding head, is used for outside welds, while the one at the rear of the boom is used to provide additional clearance at the head when it is working inside an assembly. With this arrangement, the head can be used inside a 30-in.-dia bore. Granular fusible material, used to blanket the weld as it progresses, also is fed from the rear end of the boom through suitable hoses.

Workplace arrangement around the positioner is designed to facilitate welding a wide variety of parts. Auxiliary equipment positioned beside the traversing rails (see sketch) includes a set of 75-ton capacity horizontal rolls, a 20-ton capacity universal welding positioner, and a number of smaller positioners. The large positioner is equipped with a tachometer generator which is connected to a tachometer on each control panel, so the speed of rotation can be read directly in ipm. Working height of the table of this power-driven positioner can be adjusted from 6 to 10 ft to accommodate large parts.

There is ample space on both sides of the machine runway to locate additional positioners, or other positioning equipment. Assembly of large weldments can be performed in this area, or on the positioning equipment, to minimize handling.

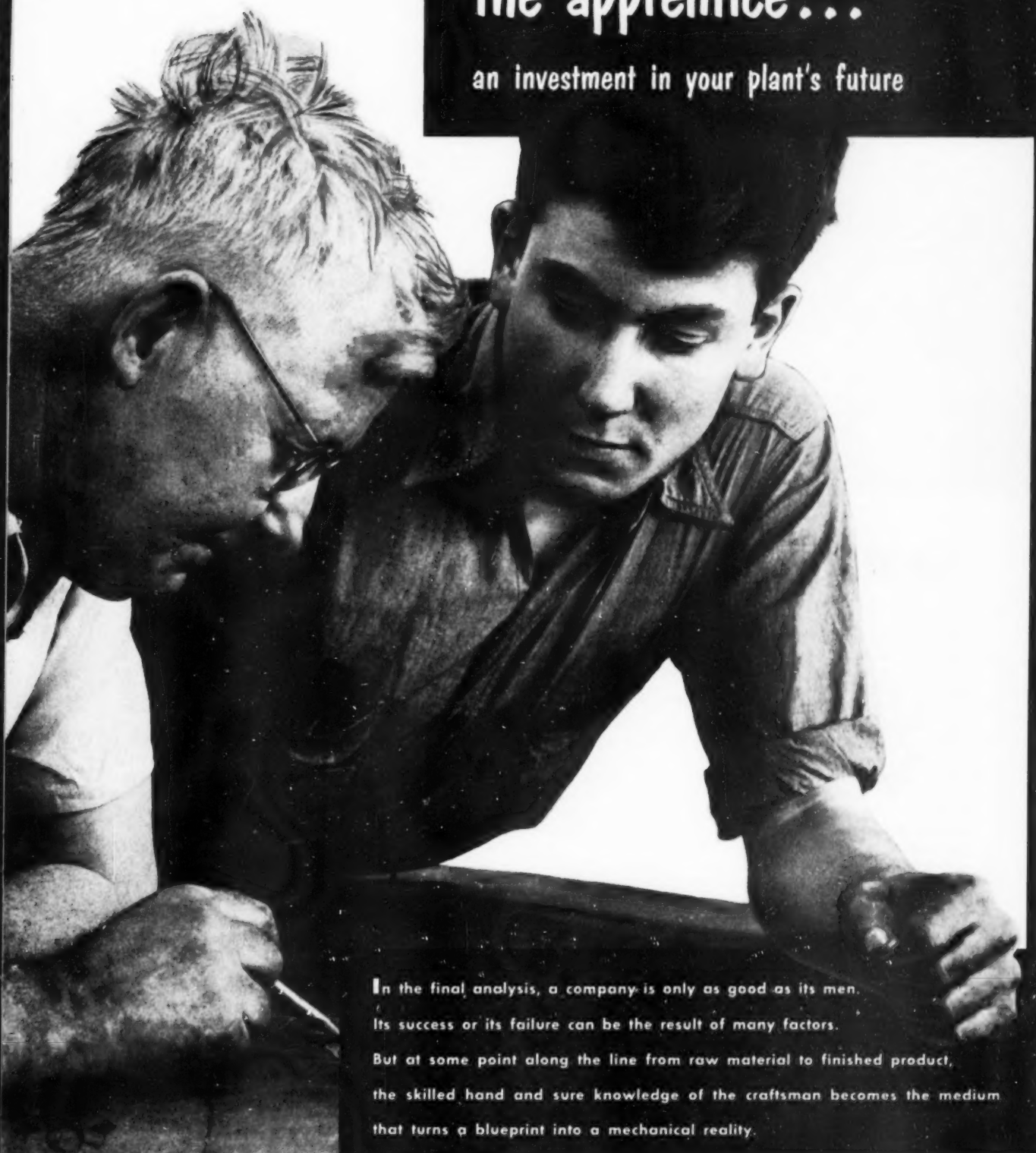
Procedures Standardized

To insure maximum efficiency and highest quality, only proved welding procedures are used. For each type of weld, a procedure sheet is prepared by the welding laboratory for use by production welders. For submerged-melt welds, these procedure sheets specify current, arc voltage, welding speeds, type and screen size of flux, type and size of filler rod or wire, sketches showing joint preparation, relative angles, and the required weld contours and number of passes. Engineering drawings for the various weldments specify that the various welds are to be made according to these procedure sheets.

Data specified on the welding procedure sheets is based on actual laboratory tests. Test welds are made and specimens are removed from the weld areas for laboratory examination. Some of these samples are examined metallographically to determine the best structure, while others are tested to determine physical properties. Several types of joints have been investigated thoroughly, and have been set up as standard for many of the most active material types and thicknesses.

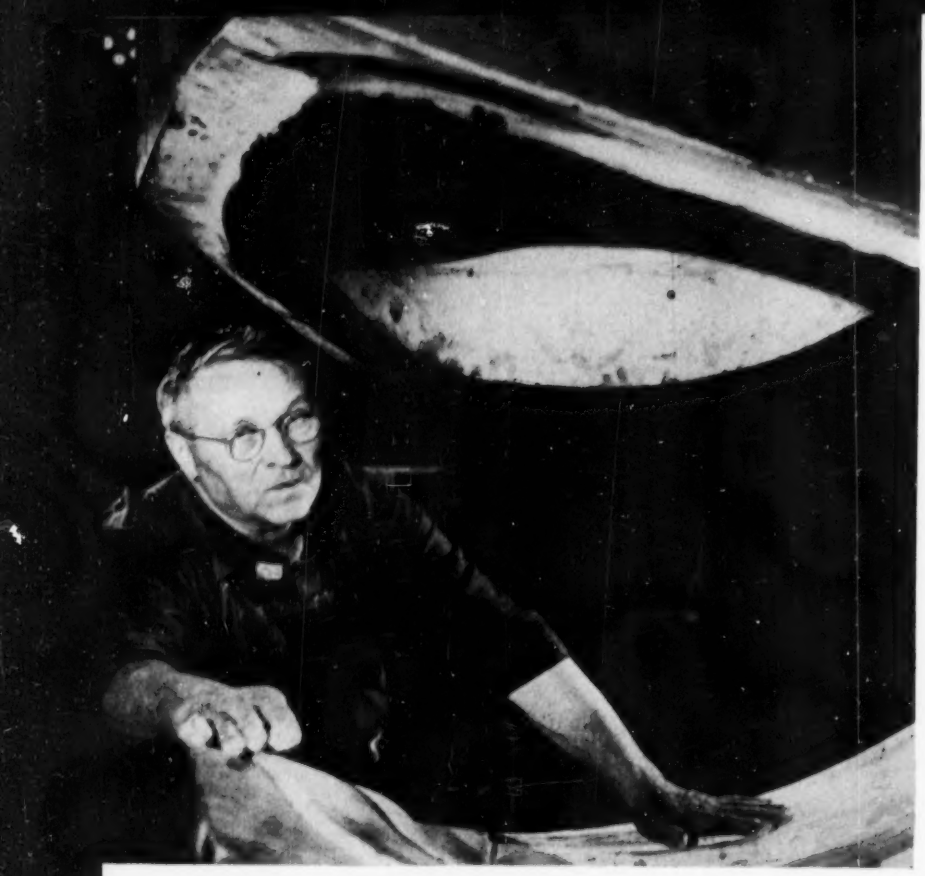
the apprentice...

an investment in your plant's future



In the final analysis, a company is only as good as its men.
Its success or its failure can be the result of many factors.
But at some point along the line from raw material to finished product,
the skilled hand and sure knowledge of the craftsman becomes the medium
that turns a blueprint into a mechanical reality.

SPECIAL REPORT NO. 348 TO THE METALWORKING INDUSTRIES
McGRAW-HILL PUBLISHING CO., 330 W. 42nd ST., N.Y. 36, N.Y.



this man is a craftsman

He is Zachary Rudenko, 65, a die punch finisher at Chrysler Corp's DeSoto plant, Detroit. In his 33 years at his trade, he has developed a sense of touch, it is claimed, to where he can check die smoothness to within .0005 in. He is retiring this year.

...who will take his place?

SHOP TRAINING CLASS on use of milling machines at Douglas Aircraft Co, Santa Monica, Calif

APPRENTICE TRAINING..."as the

Today's craftsman won't be around forever to provide the skill and practical guidance every shop needs. He can be replaced only by a man who has acquired a broad and thorough education in every phase of shop work—the journeyman machinist or tool and diemaker who has served a long-term apprenticeship in his trade.

But for many years, there just haven't been enough apprentices to go around. True, their number is increasing, through the combined efforts of labor, management, federal and state bureaus, industrial and civic groups, trade and technical societies. In spite of this, metalworking industries are still far short of filling their apprentice quotas. Topping the list of "critical trades" in need of apprentices, are machinists and tool and diemakers.

As of June 30, 1952 (latest available Department of Labor figures) there were 7874 machinist apprentices in the US, and 6345 tool and diemaker apprentices. These represent the number registered with the Bureau of Apprenticeship and comprise somewhere between 35 and 50% of the total apprentices engaged in the two trades. Thus the number of apprentices graduating to journeyman machinist and tool and diemaker status each year is somewhere around 6000—an infinitesimal proportion of the millions of workers employed in US metalworking.

Today, in the face of a growing US economy and unprecedented industrial expansion, skilled machinists and tool and diemakers are diminishing in number at a rate of 4% per year through natural attrition —death, occupational changes and retirement.

They must be replaced. The only way a company can insure a continuing supply of skilled tradesmen to fill their shoes is to train its own apprentices. Industrial groups, labor unions, federal and state agencies stand ready to assist in this.

But to the firm intending to set up its own apprentice training program, two obstacles immediately present themselves—men and money. One metalworking firm estimates it needs to spend from $1500 to $2000 per year per apprentice over a four-year training period.

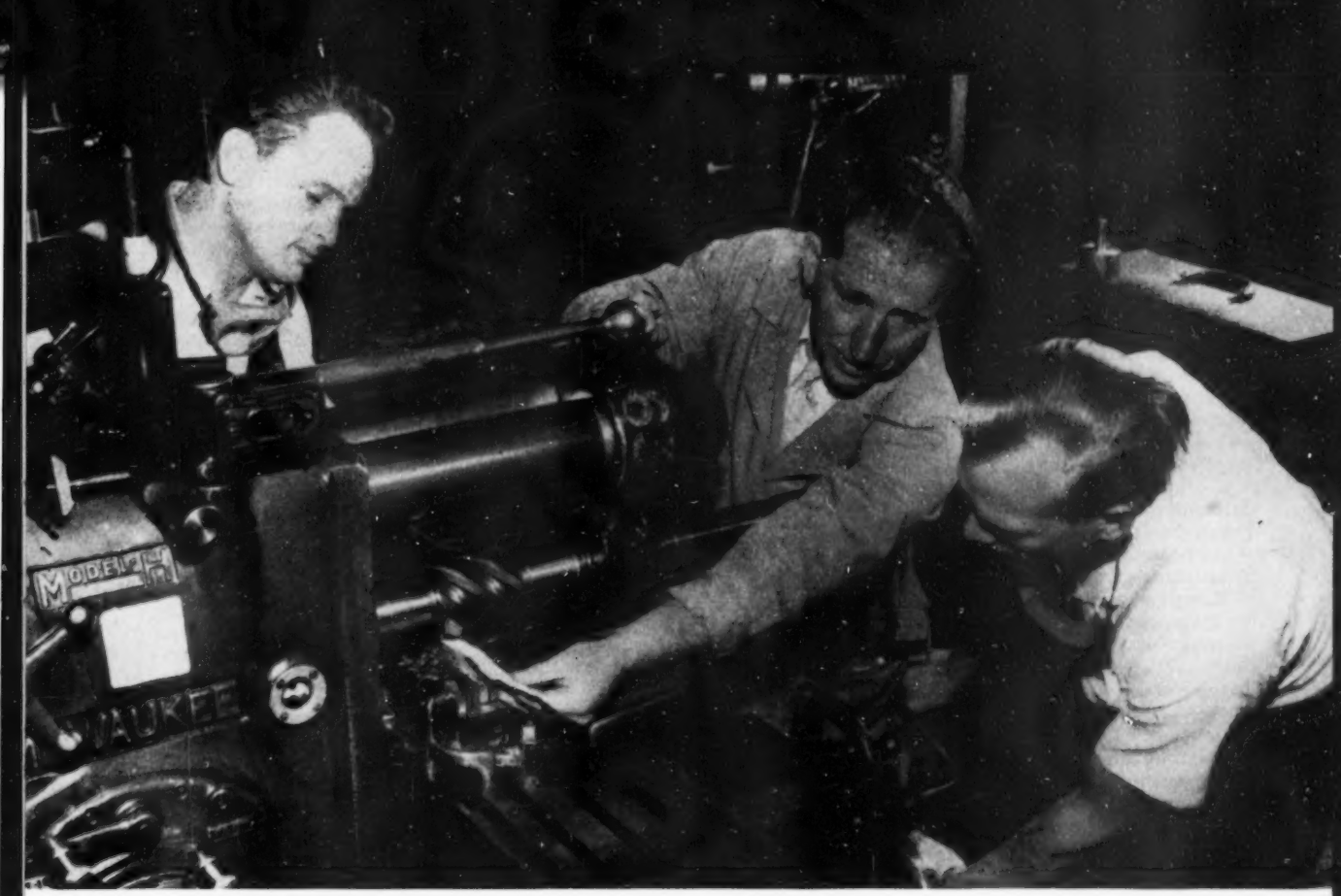
This includes the apprentice's wages, administration, special equipment and tools, etc. Even in a small shop with only 10 young men in training, annual investment will run well above the $20,000 mark. But much of this training expense can be written off because the apprentice assists in actual production during his training.

As one tool and die firm executive put it, "It costs both management and the apprentice something—management in the form of actual cash outlay—and the apprentice must make many sacrifices, financial and otherwise. But they're both investing in a sound future."

And knowledge of a trade *is* an investment in the future of any man, but getting that point home to young men is one of the toughest problems industry is up against today.

The White Collar Myth

In recent years, young people have somehow come to regard manual labor as inferior to the professions and



twig is bent, so grows the tree"

white-collar jobs. Parents are in a great measure responsible for this attitude. Typical protagonist of this viewpoint is the father who has been a manual laborer all his life who says, "I want my boy to have a better break than I did." This well-intentioned father scrimps and saves to put his son through college to qualify him for a white-collar job or a "glamor" profession. The son's inherent natural aptitude for skilled manual work is ignored—the already overcrowded glamor professions gain another recruit, and industry loses a fine potential craftsman.

This attitude certainly cannot be reconciled with the economic facts of life. To put it into basic terms, more millionaires are born out of heavy industry than all the glamor professions put together. And the "open sesame" to success in industry is apprentice training—the equivalent of a university degree in Metalworking. One company recently bewailed the fact that it couldn't keep its graduate apprentices on the bench. Less than a year after they became journeymen, upwards of 95% were employed in supervisory capacities.

Mental Attitudes

Potential recruits for apprentice training are apt to take a dim view of the long, hard road to journeyman status. Some of the questions they pose are tough ones to answer—"I'm on my own, how can I live on apprentice pay for four or five years?" or "I want to get married, I can't support a family on apprentice pay, why should I wait several years when I can go out right now and earn good money as a production worker?"

They're tough questions, admittedly. But the answer is obvious. Apprentice training fits a man for an established and respected niche in industry. The fully trained worker is a man with a future—all doors are open to him. And he is much more secure in his job than the half-trained worker.

Launching the Program

Once the twin bugaboos of apprentice training—"Where do we get the men?" and "Where do we get the money to train them?" have been licked, a firm is ready to launch its training program. This should not be a hit-or-miss affair in which several young men are let loose in a shop to pick up a smattering of this and a smattering of that. Rather, an apprentice training program must be well thought out and coordinated to the nth degree to assure that the apprentice acquires the maximum possible skill in his allotted training time. To accomplish this it is necessary to hire a full-time training director.

The Training Director

The training director must be a man thoroughly grounded in all phases of shop work—one who knows the relative value of each training phase and how much time to devote to each. He must inspire confidence in both the apprentices and the shopmen from whom they will be learning. His is the responsibility for the success or failure of the program.

The training director can get plenty of help in setting up an ap-

prentice program. Since 1937, when it was created, the Department of Labor's Bureau of Apprenticeship has been a coordinating factor in setting up national training standards and practices. Primary functions of the Bureau are (1) collection of available information on the subject to aid in formulation of apprenticeship policy, (2) familiarizing high school and vocational school students with apprentice training objectives and advantages, (3) employment counselling, (4) supervision and regulation of apprenticeship policies, (5) protection of apprentices, (6) encouraging uniformity of training, (7) providing related schooling.

These functions are also performed by State Apprenticeship Councils. In the 29 states where they operate, the Bureau of Apprenticeship drops out of the picture. Thus the Bureau confines its direct supervision to non-State-controlled areas.

The Bureau of Apprenticeship has also been instrumental in establishing more than 7000 joint apprenticeship councils in hundreds of US industrial centers.

Joint Apprenticeship Councils

Joint apprenticeship councils are usually city-wide in scope and are made up of equal representation from management and labor, usually five men from each. Often the Bureau's area supervisor and heads of local trade schools act as consultants to the committee.

Functions of the joint apprenticeship council are: (1) insuring that the employer has adequate facilities for training, (2) establishing minimum training and educational requirements, (3) approving agreements between employers and apprentices, (4) aiding training supervisors in their relations with employers and apprentices, (5) adjusting apprentice-employer differences when such differences are not covered by working agreements and cannot be settled by supervisors, (6) screening apprenticeship applicants for manipulative skills and technical knowledge, and (7) assuming responsibility for maintenance of training standards, and helping to interest the public in apprenticeship.

An example of this is Fort Wayne, Indiana's Joint Apprenticeship Council, which supervises training of both machinist and tool and diemaker apprentices and has a separate program for each.

In the machinist trade alone, some 165 joint apprenticeship councils are operating in 29 states. These groups on the average represent 19 companies and are usually composed of six members each from management and labor.

Independent Training

Where it is not practicable for a firm to participate in an area-wide or city-wide program, or in cases where the employer wishes to operate his own training program independent of government, state or local supervision, he can set up a plant joint apprentice committee, again composed of equal representation from management or supervision, and labor, to advise the training director and administer standards.

Thus the chain of command in apprentice training is the area joint apprentice committee or the plant joint apprentice committee, the training director, and under him, the shop superintendent, the foreman, the machinist or tool and diemaker, and the apprentice.

Apprentices per Plant

The number of apprentices to be trained by each plant depends primarily upon the number of journeymen it employs, secondarily upon such local conditions as future plant expansion, turnover and retirement rates. Thus the ratio varies widely. A Midwest textile machinery manufacturer sets the ratio at one apprentice for every five journeymen, plus one for the shop.

The Texas Joint Apprenticeship Committee for Machininsts advocates one apprentice for the shop and leaves the exact apprentice-journeyman ratio to the employer's discretion, dependent upon future expansion and turnover. St. Louis Joint Apprenticeship Council advocates a 1-10 ratio.

A West Coast aircraft manufacturer has ruled that its number of apprentices must not exceed 10% of total journeymen employed. Here, as in virtually all plants, the number of apprentices diminishes in direct ratio to the number of journeymen laid off in case of recession or emergency. In other words, if 10 journeymen are laid off, one apprentice is laid off—with the newest apprentices being first to go.

Recruiting

With its training setup established, a plant's first problem is where and how to get trainees. High schools and vocational schools are, of course, the most fertile fields. Here a great deal of spade work must be done to overcome parental objections and point out the advantages of the machinist and tool and diemaker trades as lifetime careers. In recent years, there has been a trend to recruit apprentices from semi-trained shop men who came into the industry during World War II or during the recent Korean emergency. These men were put directly into production work, usually assigned to a machine, and are consequently only half-trained. Many of them have a latent talent for more skilled work and are worth retraining for the trades. As a consequence of this, many companies have advanced their acceptance age limits to as high as 30.

Normal acceptance ages for apprentice training vary from 16 to 23 years. But the upper age limit is extended in most areas if the applicant has shop experience or if he is a veteran.

Educational Requirements

Schooling requirements vary widely. Some areas and firms require only two years of high school. Others

A CASE HISTORY OF APPRENTICE ADVANCEMENT

(Source: Kearney & Trecker Co)

Present Position	Total	AGE GROUPS Under 30	30-39	40-49	50 & Over
Total employees	218	36	124	39	19
SUPTS, FOREMEN	55		34	15	6
Plant Supts	14		4	7	3
Foremen	16		12	3	1
Other Dept heads	12		7	3	2
Asst foremen	13		11	2	
JOURNEYMEN	92	20	44	17	11
ENGINEERS & OFFICE PERSONNEL	71	16	46	7	2
Administrative	20	7	12	1	
Engineers	32	6	24	1	1
Sales, Servicemen	12	2	7	3	
Sub-contracting	4		2	2	
Production	3	1	1		1

A CASE HISTORY OF APPRENTICE/EMPLOYEE RATIOS

(Source: Kearney & Trecker Co)

Year	No. Shop employees	No. apprentices	No. other Shop employees	Employees per apprentice
1901	12	3	9	3.0
1905	40	20	20	1.0
1910	190	22	168	7.6
1915	400	25	375	15.0
1918	723	25	698	27.9
1921	68	17	51	3.0
1923	166	12	154	12.8
1929	904	65	839	12.9
1933	120	36	84	2.3
1939	1316	102	1214	11.9
1942	4090	203	3887	19.1
1943	4155	82	4073	49.7
1944	2812	22	2790	12.7
1949	893	32	861	26.9
1952	1701	45	1656	36.8

Application for Apprenticeship

(Suggested Form)

To be filled out in applicant's own handwriting.

On this ..... day of ..... 19 ....., I hereby make application for apprenticeship to the machinist's trade in the works of The ..... Company, and agree to conform to the Company's Conditions of Apprenticeship and to the rules governing workmen in the Company's employ.

Name in full .....

Address .....

*Place of birth ..... Date of birth .....

Father's or guardian's name ..... *Is he a U. S. citizen? .....

*Father's birthplace .....

Father's occupation or profession .....

Name of High School you attended .....

Vocational education, if any ..... Graduated when? .....

In what youth and school activities have you participated—social, athletic or otherwise? .....

List the jobs you have held

Employer	Dates From	Dates To	Type of work

Why do you wish to learn the machinist's trade? .....

Why have you applied at The ..... Company? .....

* These questions are not permitted by the Fair Employment Statutes of some states.

require a high school diploma and give preference to students who have taken algebra, geometry, trigonometry, physics and/or chemistry.

In many areas, applicants meeting the above qualifications are thoroughly screened and tested for mechanical aptitude by the joint apprenticeship council or by a plant joint apprenticeship council. These tests are often waived if the applicant graduated from high school in the upper two-fifths of his class.

Terms of Indenture

The applicant then signs an indenture in which he agrees to work for a specified period, follow instructions, obey company rules, keep trade secrets, etc. The employer agrees to teach the apprentice a trade in conformity with a detailed, predetermined work schedule.

The employer has the right to cut hours of employment, suspend the apprentice in case of a business recession, or terminate the contract if the apprentice fails to come up to standard. On the other hand, the apprentice may terminate his training at any time.

Probationary Period

In line with this, most firms have a probationary term, varying anywhere from 500 to 1000 hours of work, or from 12 to 16 weeks. During this period, either party may terminate the agreement.

Length of Apprenticeship

The period of apprenticeship training varies with particular areas or companies, but the Bureau of Apprenticeship recommends 4000 or more hours, plus 144 hours per year of related instruction. National Machine Tool Builders Association recommends a total of 6-8000 hours divided into 2000 hours in the shop and 144 hours of classroom instruction per year.

Company "A" requires a four-year course of 8320 hours—6395 in the shop, 1925 at a recommended technical school. Company "B" asks 9000 hours of "reasonably continuous employment" and gives credit for shop experience, entitling the apprentice to the wage of the period to which he is advanced. Company "C" requires 8320 hours of training, not less than 4160 of them in the shop.

Company "D" insists that its machinists have 8000 hours of shop and 600 hours of related instruction, and to become a journeyman tool and diemaker, an apprentice must complete the machinist's course, then take

4000 more hours of shop training and 300 hours of related instruction.

Rates of Pay

Rates of pay for apprentices are usually based on percentages of a journeyman's wages, with the apprentice receiving a progressively higher percentage each year or training period. For example, the Texas Joint Apprenticeship Committee for Machinists advocates 50% of journeyman pay for the first 1000 hours (approximately 6 months), 55% the second 1000 hours, 60% in the third, 65% the fourth, 70% the fifth, 75% the sixth, 80% the seventh, and 90% the eighth. This is recommended by the Bureau of Apprenticeship as a fair wage.

A prominent aircraft manufacturing firm pays 55½% of its Labor Grade 1 salary for the first 1040 hours, then 59½%, 63%, 69%, 72%, 80%, 88%, and 92%.

The St Louis Joint Apprenticeship Council advocates a minimum starting rate of $.75 per hour. Thereafter, wages increase the equivalent of ⅛ of the difference between the starting rate and journeyman pay every 1000 hours.

These rates of pay are based on a normal work day and normal work week. Overtime is paid, but the overtime itself does not apply to the apprentice training term.

Bonuses

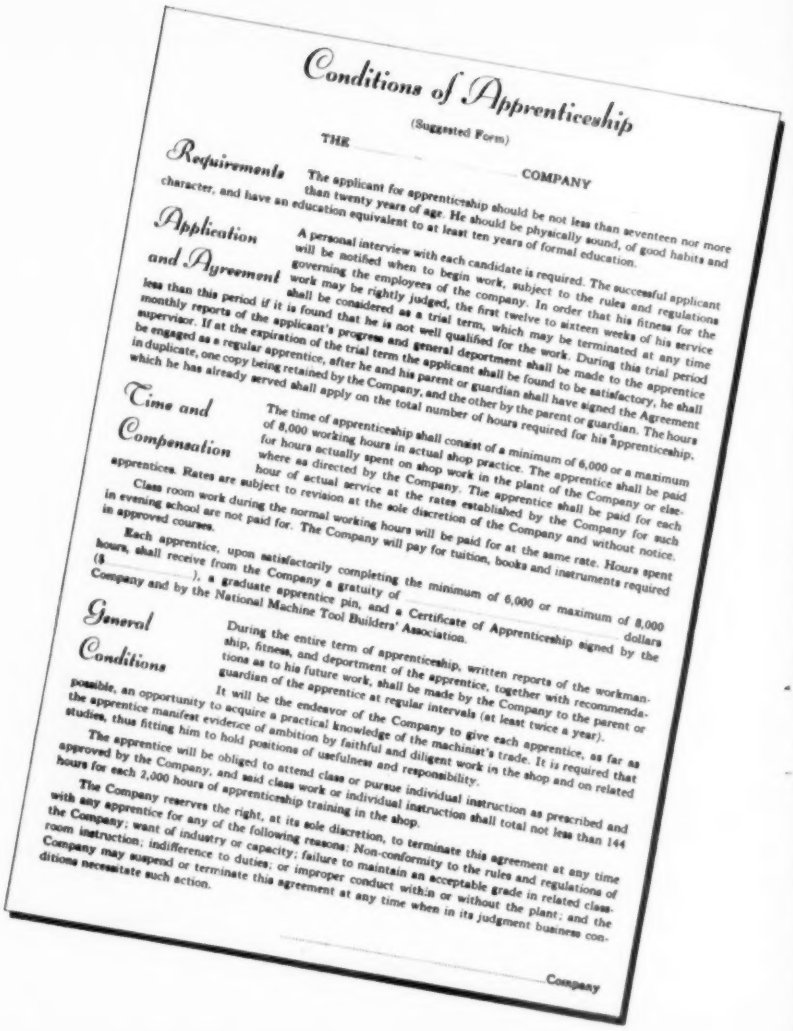
Some firms pay the apprentice a bonus upon completion of his training, some do not. The amount varies considerably but is usually from $100 to $200.

Related Instruction

Related instruction in trade and technical schools is mandatory. The one exception is in areas where no such educational facilities are available. There the apprentice may take approved home study courses. Companies pay the tuition and provide books and necessary instruments. Almost universally, the minimum is 144 hours per year in specific courses, with hourly credit applied on total apprentice training time.

Company and regional policies differ greatly on payment of wages to the apprentice for the time he spends in classes. Generally, if classes take place during working hours, the apprentice is paid at his regular hourly wage. If classes are in the evening, some companies pay full wages, others half wages, some none at all.

Such related instruction, which may or may not be applied to the term of apprenticeship, usually con-



Conditions of Apprenticeship

(Suggested Form)

THE _____ COMPANY

Requirements The applicant for apprenticeship should be not less than seventeen nor more than twenty years of age. He should be physically sound, of good habits and character, and have an education equivalent to at least ten years of formal education.

Application and Agreement A personal interview with each candidate is required. The successful applicant will be notified when to begin work, subject to the rules and regulations governing the employees of the company. In order that his fitness for the work may be rightly judged, the first twelve to sixteen weeks of his service shall be considered as a trial term, which may be terminated at any time less than this period if it is found that he is not well qualified for the work. During this trial period monthly reports of the applicant's progress and general deportment shall be made to the apprentice supervisor. If at the expiration of the trial term the applicant shall be found to be satisfactory, he shall be engaged as a regular apprentice, after he and his parent or guardian shall have signed the Agreement in duplicate, one copy being retained by the Company, and the other by the parent or guardian. The hours which he has already served shall apply on the total number of hours required for his apprenticeship.

Time and Compensation The time of apprenticeship shall consist of a minimum of 6,000 or a maximum of 8,000 working hours in actual shop practice. The apprentice shall be paid for hours actually spent on shop work in the plant of the Company or elsewhere as directed by the Company. The apprentice shall be paid for each hour of actual service at the rates established by the Company for such apprentices. Rates are subject to revision at the sole discretion of the Company and without notice.

Class room work during the normal working hours will be paid for at the same rate. Hours spent in evening school are not paid for. The Company will pay for tuition, books and instruments required in approved courses.

Each apprentice, upon satisfactorily completing the minimum of 6,000 or maximum of 8,000 hours, shall receive from the Company a gratuity of _____ dollars ($ _____), a graduate apprentice pin, and a Certificate of Apprenticeship signed by the Company and by the National Machine Tool Builders' Association.

General Conditions During the entire term of apprenticeship, written reports of the workmanship, fitness, and deportment of the apprentice, together with recommendations as to his future work, shall be made by the Company to the parent or guardian of the apprentice at regular intervals (at least twice a year).

It will be the endeavor of the Company to give each apprentice, as far as possible, an opportunity to acquire a practical knowledge of the machinist's trade. It is required that the apprentice manifest evidence of ambition by faithful and diligent work in the shop and on related studies, thus fitting him to hold positions of usefulness and responsibility.

The apprentice will be obliged to attend class or pursue individual instruction as prescribed and approved by the Company, and said class work or individual instruction shall total not less than 144 hours for each 2,000 hours of apprenticeship training in the shop.

The Company reserves the right, at its sole discretion, to terminate this agreement at any time with any apprentice for any of the following reasons: Non-conformity to the rules and regulations of the Company; want of industry or capacity; failure to maintain an acceptable grade in related classroom instruction; indifference to duties; or improper conduct within or without the plant; and the Company may suspend or terminate this agreement at any time when in its judgment business conditions necessitate such action.

_____ Company

APPRENTICE TRAINING CLASS
at General Motors Corp's Fisher Body Division, Pontiac, Mich, inspecting an auto body die

Agreement

(Suggested Form)

To be filled out only after successfully completing the probationary period.

This Agreement, made the day of A. D. 19 , by and between COMPANY, hereinafter termed "the Company," "the Apprentice," and of , hereinafter termed parent or guardian of the Apprentice, hereinafter termed "the Parent."

Witnesseth, that the Apprentice shall from the date hereof become and be the apprentice of the Company to the art and trade of machinist, under and according to the terms and provisions contained in the Conditions of Apprenticeship hereto annexed and made a part hereof, and for the period therein specified, which commenced , 19 ; and that the Company and the Apprentice shall well and truly do and perform all things required to be done and performed by them in and by said Conditions of Apprenticeship and the provisions thereof.

And, the Parent, in consideration that the Company has at request executed this agreement, covenants and agrees for and the Apprentice shall well and truly do and perform all things required to be done by him in and by this Agreement and the Conditions of Apprenticeship herein referred to.

In witness whereof, the Company has caused duplicate copies of these presents to be signed and sealed by its for this purpose authorized, and the Apprentice and the Parent have hereto set their hands and seals in duplicate the day and year first above written.

By

(Apprentice)

(Parent or Guardian)

sists of shop mathematics, practical algebra, geometry and trigonometry, some blueprint reading and similar subjects.

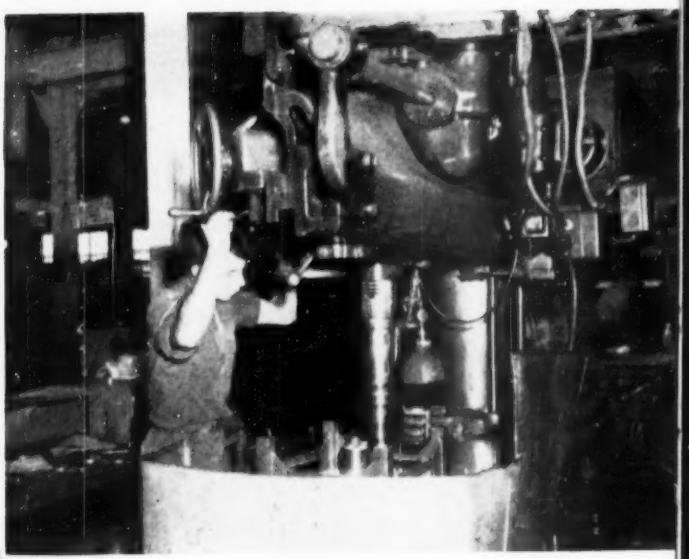
Training Phases

Actual training methods and the number of hours spent on each phase of the machinist's or tool and die-maker's work vary with the needs of the company. For instance, an aircraft company will place more emphasis upon drilling, riveting, and stretch-press operations than will an automotive manufacturer. And the industry's basic metal will have an effect on apprentice training, too—aluminum for aircraft, steel for autos.

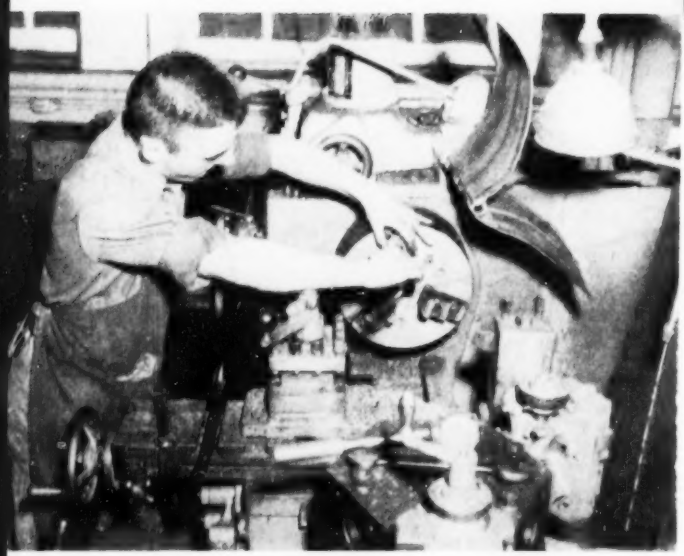
The National Machine Tool Builders' Association has spent many years in developing a broad 6000-8000-hr shop training program that is applicable not only to machine-tool manufacturers, but to the entire metalworking industry. The sequence of metalworking operations as recommended by NMTBA in the following pages is alphabetical rather than the order that may be followed in training. The number of hours given in parenthesis after each major metalworking category represents time recommended on each subject by NMTBA.

REPRESENTATIVE BREAKDOWNS OF APPRENTICE MACHINIST TRAINING

	COMPANY "X"	AREA COUNCIL	STATE COUNCIL	COMPANY "O"	NMTBA
Type of instruction			*Hours of training*		
Tool crib	320	100-200	320-480	160	
Lathes	2600	1000-1500	1280-2080	1900	1100
Milling machines	900	600-900	800-960	1360	800
Shaper, slotter	1080	700-1050	160-320	400	600
Planer	500	500-750	320-480	400	
Grinders, polishers	500	400-600		400	380
Punch press	400				
Jig borers	600	200-500	160	160	
Screw machines	200				
Machine Insp & repair		1000-1500		280	
Layout			160-320	480	
Layout & bench		500-1000			
Profile machines				240	
Ex-Cell-O and broach				80	
Heat Treating		200-400		80	
Toolmaking				800	
Tool inspection				120	
Tool design				160	
Foundry				40	
Bench & floor work	1400	500-1000	800-1120	200	1000
Welding		200-400	320-480		
Boring mills		400-600	960-1720	700	500
Gear cutting		200-400			
Drilling and tapping	400	300-500	480-800	200	300
Review, unscheduled	300	200-500		204	
TOTAL HOURS	9000	8000	8000	8000	6000-8000



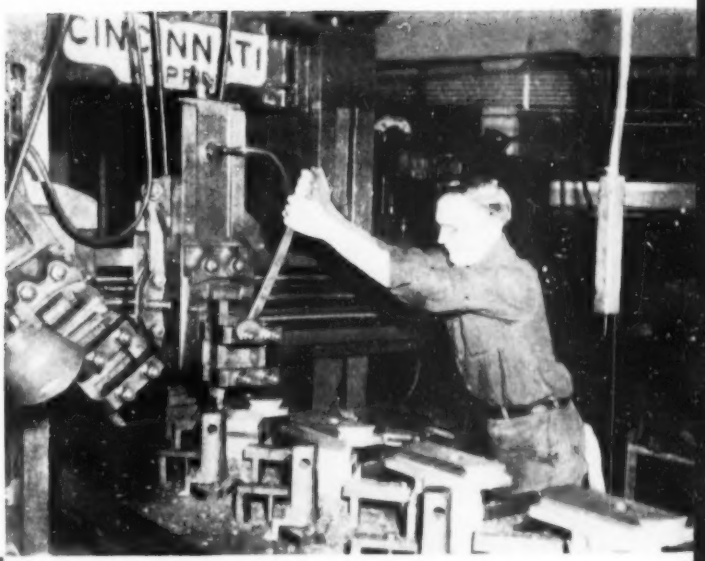
Second-year apprentice Robert Schach learning to operate a radial drill



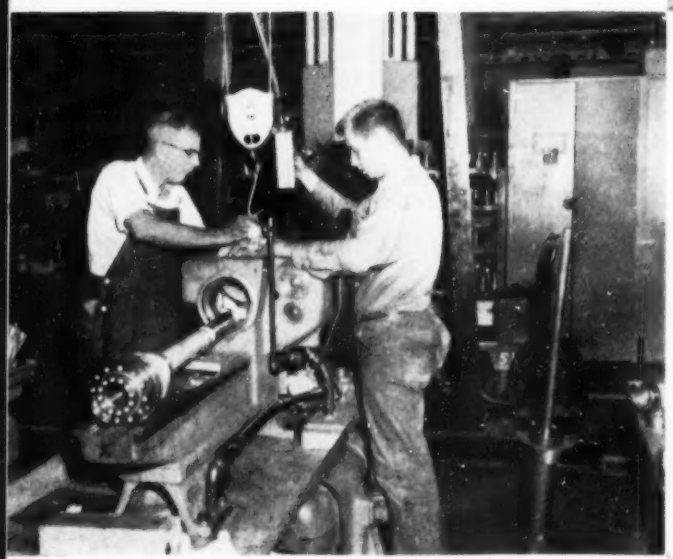
Second-year apprentice Robert Salamant attaches chuck jaws for bearing ring job on a ram-type turret lathe chuck

apprentice training in the machine

These photographs were taken at Warner & Swasey Co, Cleveland machine-tool builders. Operating within US Bureau of Apprenticeship standards, Warner & Swasey's apprentice training program closely parallels that recommended by the National Machine Tool Builders' Association

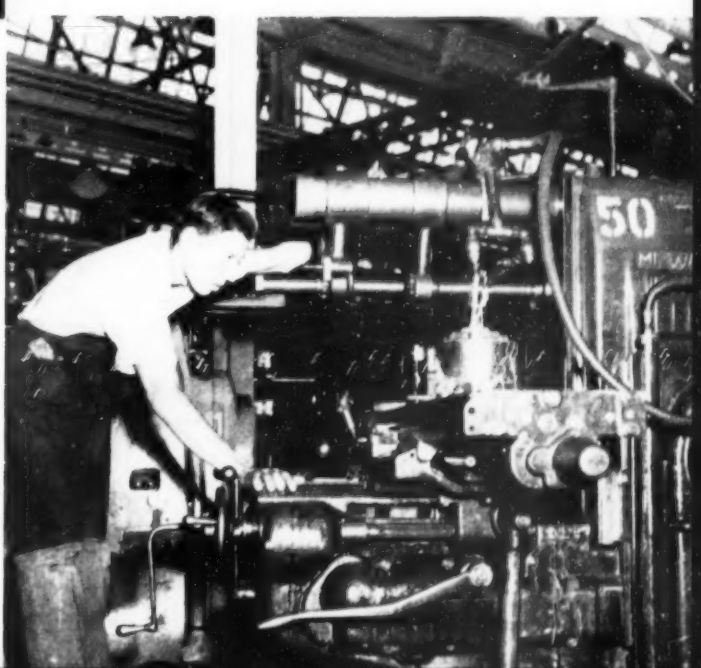


Third-year apprentice Thomas Repella adjusts planing slide body on a 20-ft planer



Second-year apprentice Norman Kish gets instruction on how to assemble a spindle on a ram-type turret lathe

tool industry



Second-year apprentice Paul Riemer learns operation of a horizontal milling machine

essentials of shop training

as recommended by the National Machine Tool Builders' Association

BORING MACHINES (500 Hours)

Vertical boring mill
Types of work machined.
Methods of holding work: *clamping to table, chucks, special fixtures.*
Types of cutters: *lathe tool type, boring bar, four-lipped drills, reamers.*
Methods of machining: *surfaces parallel to table, cylindrical surfaces, holes and internal cylindrical surfaces, tapered or conical surfaces.*

Horizontal boring mill
Types of work machined.
Spindle alignment.
Methods of holding work: *clamping to table, special fixtures (fixed, indexing).*
Methods of holding tools: *collets or sleeves, chucks, floating holders, holding face mills.*
Types of cutters used: *boring bar (methods of mounting cutters in bars), reamers, drills, multiple cutter heads for large holes, milling cutters.*
Methods of machining: *holes and internal cylindrical surfaces, facing flanges and surfaces at right angles to holes.*

Jig Borer
Types of work machined.
Main advantages.
Methods of holding work: *location for duplication.*
Methods of holding tools: *adjustable boring bar holder.*
Types of cutters.
Machining methods: *accurate spacing without laying work out, circular indexing.*

DRILLING AND TAPPING (300 Hours)

Twist drill
Parts: *point, body, shank.*
Designating sizes.
Grinding the twist drill: *lip clearance, rake angle, web thinning, retaining temper, indications of dull drills.*
Drill speeds and feeds.
Materials for drills.
Flat drill.
Oil-hole drill.

Types of drilling machines
Vertical drillpress, sensitive drill, gang drill.
Radial drilling machine.
Ways of holding cutting tools
Taper shank in socket. Use of drill chucks.

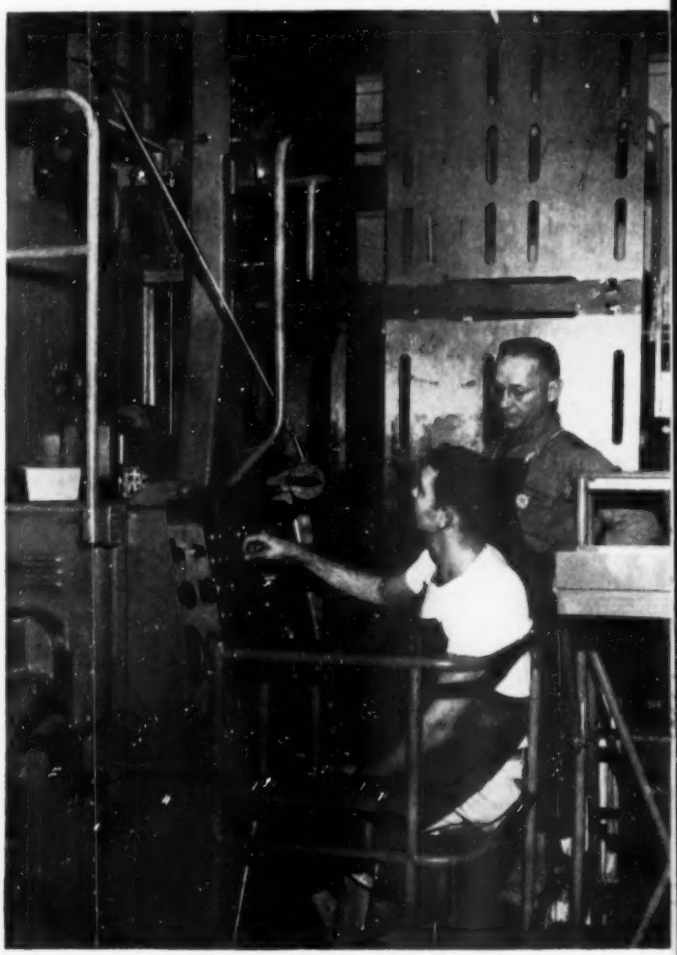
Methods of holding work
Drilljigs—universal and improvised; *methods of clamping, types of jig bushings, piloted cutting tools, accessories, care of the drill.*
Use of vise: *improvised production setups, angle plates.*
Clamping the work: *use of raising block, angle plate and knee; types and uses of clamps; clamping precautions, leveling the table.*

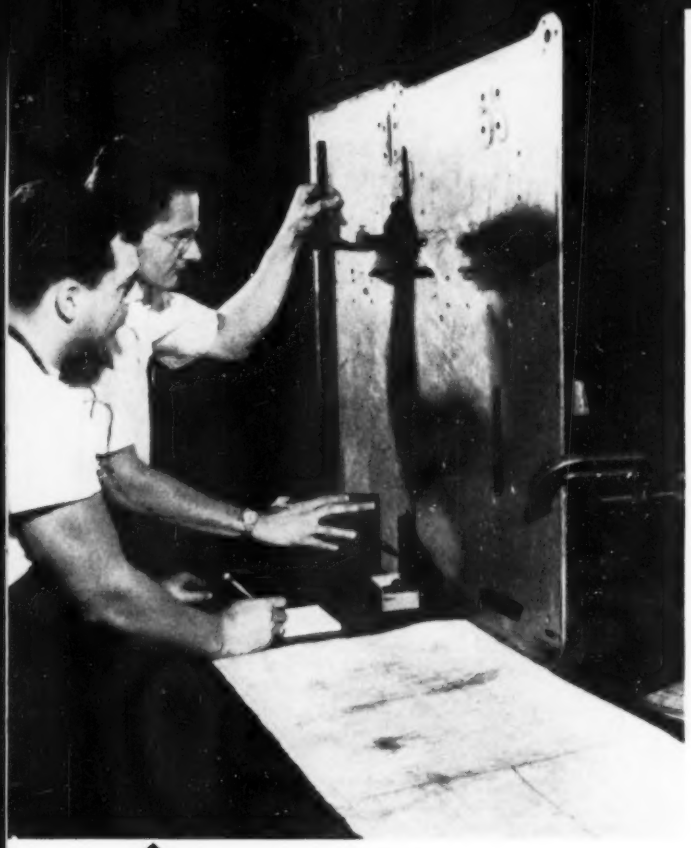
Drilling the hole
Testing drill for cutting.

This section is offered by NMTBA as a check list of subjects that should be included in an adequate apprentice training program, whether for machine tool builders or metalworking firms. Only standard types of machine tools used in cutting and fitting metals are included in this curriculum, which is designed to provide a broad training foundation for qualification as a journeyman machinist.

Apprentice (left) gets instruction on how to use a height gage at Convair, San Diego, from a supervisor who has already completed a four-year training program

Machinist apprentice Bill Pugmire handles controls of a Keller duplicating machine at Boeing, Seattle, under the watchful eye of journeyman machinist Henry Schwendeman





Drilling the hole (continued)
Clearance after cutting hole.
Care in starting the drill: *starting from a layout, drawing a drill spot to the center.*
Removing chips: *removing drill from hole.*
Drilling hard materials: *use of turpentine.*
Drilling large holes: *use of lead holes.*
Drilling small deep holes: *sweating on small drills.*
Drilling of plastics.
Cutting compounds.
Importance of rigidity.

Reamers
Purpose and parts of reamers.
Holes "close" in certain materials.
Use of piloted reamers.
Combination drill and reamer.
Other drilling tools and operations: *counterbore, butt mill and screw arbor, countersink.*

Taps and tapping
Hand taps, machine taps.
Drilling for tapped holes.
Carbon steel vs high-speed steel taps.
Tapping by power; by hand.
Use of tapping attachment.
Reversing tap to break chips.
Spotting and drilling for tap.
Measurement of drilled holes.
Tolerances.
Use of plugs, fixtures and improvised setups; checking alignment and size; rough and bell-mouthed holes.

GRINDING
(700 Hours)

Construction
Abrasives: *emery and corundum; silicon carbides, aluminum oxides.*
Bonds: *vitrified, silicate, shellac, rubber and resinoid.*

Construction (continued)
Grain: *size of abrasive or grit.*
Grade: *hard vs soft wheels, bond strengths.*
Structure: *controlled grain spacing.*
Grinding wheel classifications.
Wheel selection on basis of (a) *type of material to be ground,* (b) *amount of stock to be removed,* (c) *finish desired,* (d) *area of contact, and* (e) *type of grinding machine. Effect of wheel speeds on grinding.*
Cutting action of wheel: *glazing vs loading; self-sharpening of wheel—sizing power; coarse vs fine-grained wheels.*
Mounting the wheel: *precautions, fit on spindle and rim; test for cracks.*
Balancing the wheel: *reasons for and methods.*
Truing and dressing wheels: *tools used, diamond points —their care, speeds, cuts and coolants, canting the tool.*

Cylindrical grinding
Applications of plain grinding machines.
Universal grinding machines: *details of construction, cross-feed mechanisms.*
Care of cylindrical grinding machines: *wear caused by grit and chips, cleaning, lubrication, wear-compensating adjustments, solid foundations.*

Cylindrical grinding practice
Setting the work: *true centers and clean and true center holes; holding work in chuck and on faceplate; truing up; setting the wheel speed; setting the work speed.*
Setting the table feed: *feeds for roughing—effect on wheel wear.*
Setting the depth of cut: *limitations, advantages of automatic feed.*
Use of work rests: *back (steady) rest; rigid and spring rests; universal back rest; spotting work for rests; follower rests, center rests.*
Roughing and finishing cuts; *checking for straightness after first cut.*
Use of coolants: *function in grinding; bowing of heated slender work towards wheel; filters.*

Cylindrical grinding
Warming up grinder before cutting.
Plunge-cut grinding.
Setting stops for traverse.
Importance of time in production grinding: *cutting time and uniform sizing; judging cutting by density of sparks.*
Causes of chatter scratches, diamond marks and traverse marks.
Grinding to a shoulder: *plunge-cutting next to shoulder; plunge-cutting diameter and grinding shoulder at same time—wheel trued to two 45° angles; rounding wheels to grind fillets.*
Grinding tapers and angles: *swivel tables for slight tapers; wheel slide for abrupt tapers; swiveling headstock—work not on centers.*
Face grinding: *use of saucer wheel, swiveling headstock 90° and grinding on periphery.*
Form grinding: *plunge-cut grinding with formed wheel.*
Thread grinding (see Thread Cutting).
Roll grinding: *importance of finish.*
Grinding cams and eccentrics.

Internal Grinding
Use of relatively soft wheels: *applications for harder wheels.*
Use of coolant: *dry on universal grinder; difficulty in gaging warm holes.*

Internal Grinding (continued)
Use of internal grinding fixture: *adjustment and constant lubrication.*
Grinding straight holes: *holding work; truing up work; external spotting; use of cup wheels; bell-mouthed holes—precautions: automatic internal grinders; automatic devices, planetary grinding.*
Grinding tapered holes: *use of swivel table and headstock; testing holes for bearing and for runout.*

Centerless Grinding
Function of workrest and regulating wheel.
Inherent advantages and limitations.
Methods of centerless grinding: *through-feed method for straight pieces—regulating feed and work speed; infeed method for parts with shoulders; end-feed method for tapered work.*
Internal centerless grinding: *application; working from previously ground outer surface.*

Cutter Grinding
Economy of sharp cutters.
Wheels for cutter sharpening.
Grinding lands of teeth: *primary and secondary land clearances; grinding with periphery or face; methods for obtaining proper clearance; "cutting to" vs "cutting from" edge with wheel; end mills hollowed on end; grinding staggered-tooth cutters; grinding steep helix angles; rounding and beveling corners.*
Sharpening formed cutters: *radial-face types and faces with a rake; precaution in retaining correct form; flat and beveled sides of wheels—when used; lead-cutting attachment for hob grooves.*
Precision grinding of lathe tools on machines: *economies; grinding cemented-carbide tools; uses of universal and tool grinding machine.*

Surface grinding
Scope and features of surface grinding.
Horizontal spindle, vertical spindle and disk machines: *rotary or reciprocating tables; methods of grinding for each type of machine.*
Horizontal planer type machine: *fixtures for intricate grinding; forming wheels for special operations; use of horizontal spindle machine with rotary table.*
Vertical spindle machines: *production of accurate, less polished surfaces; use of softer wheels; principle of rotary table operation—gaging devices; reciprocating table applications.*
Use of magnetic chuck: *stops and fixtures, magnetic parallels; master piece; demagnetizer.*

MILLING
(800 hours)

The milling machine
History; types of milling machines—Column and knee, bed, planer; parts of a milling machine; type of drives; feeding mechanisms; care of the milling machine.

Setting up
Methods and cutters: *plain vs. face milling cutters; selection of cutter speeds and feeds; selection of cutter and proper mounting; considerations of rigidity in setup; setting feed stops.*
Methods for holding work: *lining up vise, clamping work in vise—use of tissue paper, wire and holddowns; steps in machining a rectangular block; use of stops and clamps; use of V-jaws, form jaws and slotted jaws.*
Clamping to table: *principles of clamping; aligning work with T-slots; use of parallels, raising plates and angle plates; supports to prevent springing; reclamping*

Foreman's Report
(Suggested Form)

Apprentice _____ Clock No. _____
Department _____
Monthly Period _____

Questions — RATING

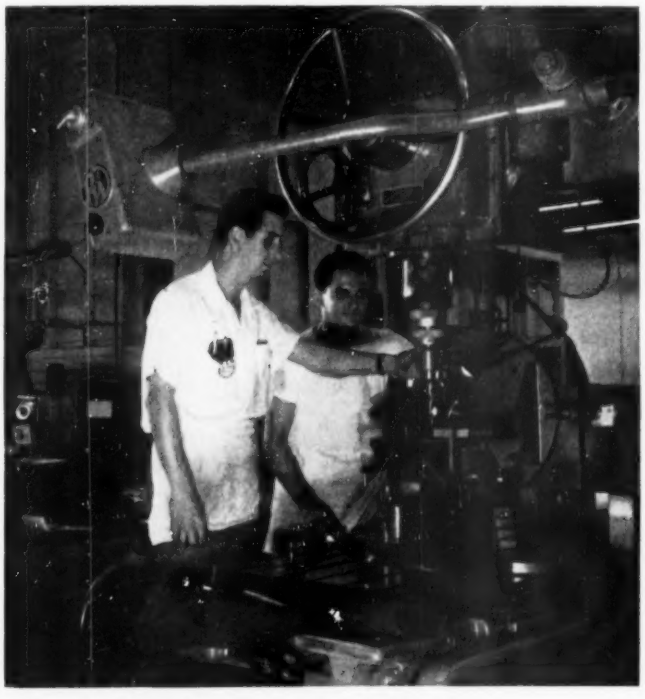
PERSONAL TRAITS (1 —"Exceptional" 2 —"Good" 3 —"Fair" or "Medium" 4 —"Poor")

1. Has he mechanical ability, shown by his handling of machinery and tools? _____
2. Is his work of satisfactory quality? _____
3. Does he regularly keep busy at his work and show interest in it? _____
4. Does he do his work in a reasonable time? _____
5. Does he learn readily and carry on his work without repeated instructions? _____
6. Does he show initiative by taking proper action without waiting for orders to proceed? _____
7. Is his department satisfactory, free of unnecessary conversation, discourtesy, sloppy appearance, or horseplay? _____

Remarks

Date _____ Signed _____ Foreman

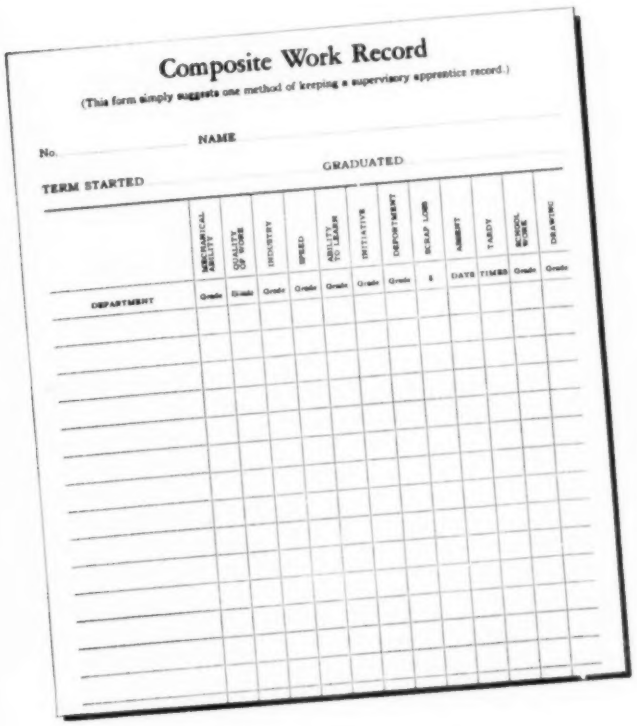
(Over)



Apprentice (left) and journeyman operate a jig borer at Lockheed's Burbank, Calif, plant

work before finishing; use of studs, stops, jacks and clamps.
Use of fixtures: *design and handling, methods of locating and clamping.*
Setting the cutter: *allowing for backlash; centering to cut the keyway, straddle and gang milling; cutting dovetails—cutting the tapered side; cutter speeds—factors to consider; feeds.*
"Climb" milling: *advantages—importance of rigidity, no backlash; not always used on cast iron—prying up scale.*
Use of coolants.
Milling to limits—production methods.
Avoiding undercuts when finish milling.

Cutters
Importance of proper selection—factors limiting cuts.
Types of cutters: *plain milling cutters — purpose of spiral gash; coarse-tooth milling cutter; helical milling cutter; side milling cutters—straddle mills, staggered-tooth cutters and interlocking cutters; face milling cutters; angular cutters; end mills—two-lipped end mill; formed cutters and profile cutters; saws—types and uses; T-slot cutter, keyseat cutters, fly cutters, etc; right-hand and left-hand cutters.*
Cutter materials: *carbon steel and high speed steel; stellite and carbides.*
Number of teeth in cutters—*advantages of coarse-tooth cutters.*
Methods of driving (fastening) cutters.
Sharpening cutters: *primary and secondary clearance; dragging and chattering; grinding formed cutters—precautions.*
Cutter failures—causes and remedies.
Care of milling cutters: *economy of sharp and true cutters.*



Composite Work Record

(This form simply suggests one method of keeping a supervisory apprentice record.)

No. NAME

TERM STARTED GRADUATED

DEPARTMENT	MECHANICAL APTITUDE	QUALITY OF WORK	INDUSTRY	SPEED	ABILITY TO LEARN	INITIATIVE	DEPARTMENT	SCRAP LOSS	ABSENT	TARDY	SCHOOL WORK	DRAWING
	Grade	Grade	Grade	Grade	Grade	Grade	Grade	$	DAYS	TIMES	Grade	Grade

Attachments
Vises, index centers, vertical and universal milling attachments, etc; care of attachments.

Production milling
Factors to consider in selecting equipment.
Cycles for automatic milling.
Features of electrically-controlled machines: *electrical vs. mechanical reversing; use of backlash eliminator.*
Gang milling: *limitations caused by varied cutter daimeters.*
Planetary milling.
Profiling machines: *use of templets.*
Production estimating.
Indexing and advanced milling.
Universal spiral index head; plain indexing; differential indexing; cutting spirals—*computing change gears and table offset;* cam cutting—*computing lead, change gears and angles for spiral head and vertical attachment; graduating; gear cutting.*

SHAPING AND PLANING
(600 hours)

Function of the planer
Machining flat surfaces with single-point tool: *features of planing operation.*

Planer Construction

Size of planer
Openside planer.
Units of planer construction: *bed—care and maintenance; platen—protection against bruises; crossrail—testing for squareness; siderail; toolhead—swivel head, clapper box and apron; driving mechanisms—"bull-wheel" drive; hydraulic drive; reversing mechanisms; planer speed; feeding mechanisms—ratchet and pawl mechanism, function of the rocker, adjustment of feed.*

Planer work
Methods of holding work: *planer vise, planer centers; holding work on platen; magnetic chuck; fixtures for specific work.*
Clamping accessories: *clamping blocks, shims, jacks, adjustable stops, fingers, planer strips, T-blocks, etc.*
Clamping principle: *secure work without springing; reclamp work before finishing, etc.*
Methods of clamping: *stops and supports to take thrust of cut; hold-downs for thin pieces; aligning strips and T-plates; angle plates and knees.*
Leveling the work.
Laying out the work.
Measuring and gaging: *testing of flatness—use of straight edge; rocks and hollow sounds; standard measuring instruments; planer gages, templets, sine bars, etc; measuring dovetails—use of plugs.*
Planer cutting tools: *similarity to lathe tools; types of planer tools—purpose of gooseneck, slot cutting tools—use of tool lifter; setting the tool—rigidity, factors affecting cutting speed, feed and depth of cut; taking the cut—precautions; roughing cut—cut below scale on cast iron, edges beveled at end of cut; finishing cut—for steel and for cast iron, use of wide square-nose tool; setting head, apron and swiveling head; planing surfaces square and parallel; undercut planing; form planing; planing tongues and grooves, slots, keyways, etc; sizing T-slot with radius tool; planing dovetails; gang or multiple planing, fixtures and templets; use of two or more tools at one time.*

THE SHAPER

Purpose of shaper

Shaper construction: *parts, size, crank-shaper driving mechanism—circular motion to reciprocating motion, bull-wheel, crankpin and rocker arm; length and position of stroke, speeds, quick return; hydraulic shaper, draw cut shaper; worktable—feeds and adjustment, universal table; shaper feeds—feeding mechanism, cam-operated feed action, toolhead.*

Shaper work

Holding the work: *shaper vise—setting up, clamping rectangular piece to shape, clamping to worktable.*
Cutting in the shaper—*planing keyways, external and internal; cutting dovetails, knurling, etc.*

ENGINES AND TURRET LATHES
(1100 Hours)
Engine Lathes

Classification

Types: *engine lathes and bench lathes.*
Size (swing x length).
Fundamental operations.

Care

Cleanliness and order, oiling, safety.

Construction

Major units of engine lathe and their functions: *bed, headstock, carriage, feeding mechanism, tailstock, power unit, lathe accessories.*

Bed

Construction: *importance of rigidity, ways or shears.*
Various designs: *purpose of V's, inner ways for headstock and tailstock, outer ways for carriage. Steel added to cast iron to improve wearing qualities.*
Care of the bed: *leveling, cleaning and oiling ways daily to avoid gummy surface, keeping ways free from grit and tools, use of tool rack.*

Headstock

Parts of the headstock: *spindle and bearings, speed selection with cone pulleys and back gears, function of back gears and lockpin; care of headstock—importance of alignment and regular lubrication.*
Geared-head drive headstock: *advantages of geared-head lathes—convenient speed changes; power economy, reduced accident hazards; advantages of helical-geared drives compared to spur gears.*

Carriage

Main parts: *saddle and compound rest, tool post, cross-feed stop; apron—driven by feed rod or by lead screw, half-nuts, feed rack and pinion.*
Care of the carriage.

Feed mechanism

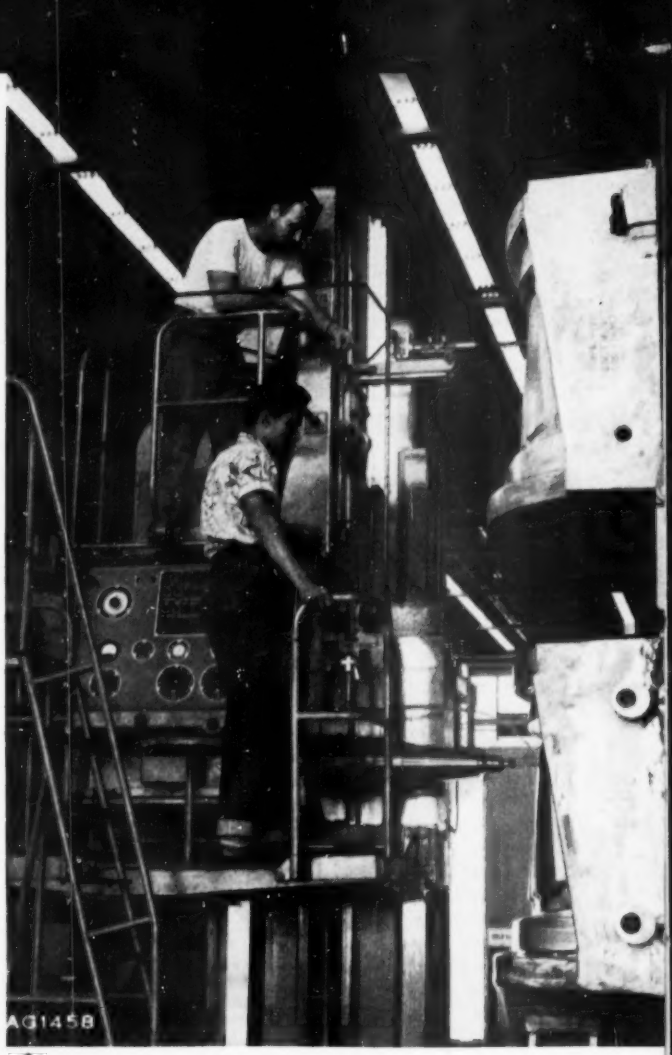
Construction: *end gear train from spindle to gear box—reverse gear plate, tumbler gears, quadrant; quick-change gear box—"cone" of gears; lead screw and feed rod, splined lead screw, stop rod and feed-reverse rod.*

Tailstock

Construction: *parts, longitudinal adjustment mechanism, importance of rigidity and alignment.*

Accessories

Lathe centers: *live and dead (soft and hard) removing lathe centers.*
Driver plates (dog plates).
Lathe dogs (work drivers).
Taper sleeves: *smaller centers in larger bores.*
Lathe chucks: *adapters; kinds of chucks—independent, universal, combination, automatic (compressed air or spring operated, collet chucks).*
Face plates, drill chucks.
Steady rest (center rest) for long slender work.
Follower rest to prevent springing of work.
Taper attachment.
Thread chasing dial.
Automatic carriage stop.
Cathead for rough work supported with steady rest.
Spider to support hollow work for turning outside surfaces.
Ball turning rest.
Carriage stop.
Centering.
Center holes: *size of center drill and of hole, importance of uniform bearing, cleanliness and oiling; methods of centering: layout and drill in lathe or in drill press, center drill in headstock spindle of lathe, laying out center holes with hermaphrodite caliper, center square, surface gage and "V" blocks; in centering machine; in lathe—use of chuck or back rest, center drill in tailstock spindle; drilling the center hole—use of coolant for certain metals, causes of drill breakage,*



Apprentice (above) learns technique of duplicating machine operation at Lockheed Burbank

Machinist trainee (third left) sets up a job on a milling machine at Northrop Aircraft, Inc, as instructor, leadman and foreman look on

removing broken center drill; testing on bench centers—chalk to test runout, indicator for accurate check; importance of correct bearing—test using prussian blue and newly ground lathe center.

Testing Centers

Runout: *work not concentric when cuts meet, testing with indicator, truing lathe centers—turning soft centers, annealing and turning hard centers; grinding hard centers—protecting ways with cover, testing angle.*
Alignment: *methods of testing, rough methods—aligning points on tailstock, matching centers; accurate methods—turning sample piece, no taper, test bar and dial indicator.*

Cylindrical turning (rough) between centers

Centering.
Testing centers for runout and alignment.
Mounting of lathe chucks, face plates and driver plates.
Adjusting work between centers: *clean centers and center holes, clearance for lathe dog, adjustment of tailstock spindle, oiling dead center, lubricating oil and white lead.*
Adjusting cutting tool—*on center or slightly above, importance of rigidity, setting tool to avoid "digging in" the work.*
Selecting speeds and feeds.
Taking cut.

Cutting tools

Materials for cutting tools: *carbon steel, high speed steel, stellite, carbides.*
Angles of cutting tools: *angle of wedge, rake—front rake (back rake), negative rake for intermittent cuts, side rake; end clearance, side clearance.*

Types of tools

Grinding cutting tools: *carbon steel and high speed steel ground wet, stellite and carbides ground dry, forcing the grind, use of entire face of wheel, selection of grinding wheels, importance of proper tool rest and true wheel.*
Chip control: *combination of back and side rake angles, grooving the cutter, curling grooves and "chipbreakers," coolants and their function.*

Mandrels and their use

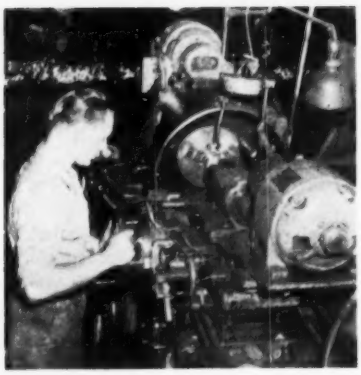
Types of mandrels: *solid mandrels, expanding mandrels—expansion (split) bushings, gang mandrels, cone mandrels.*
Use of mandrels: *examining center holes and surface of mandrel, checking for runout, importance of oiling surface, cleaning center holes and oiling dead center.*

Steady rests and follower rests

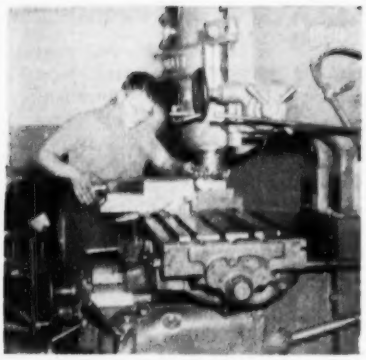
Steady rest (center rest): *false jaws to prevent scouring; lubrication, adjusting the rest, accurate method of alignment.*
Follower rest (back rest): *method of adjustment, adjustment to prevent springing.*

Chucks and face plates

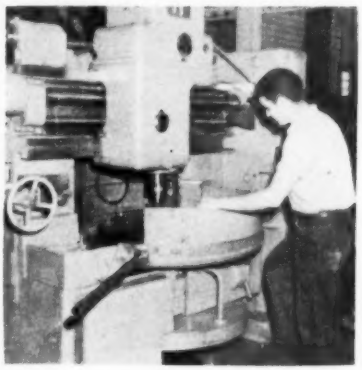
Mounting work: *in chuck; on face plate—studs and counterweights, parallels and angle plates, wiggler (center tester), toolmaker's buttons, paper to prevent slippage, use of dead center when clamping.*



Apprentice grinding a shaft pinion on an internal grinder at Warner & Swasey



Warner & Swasey 2nd-year apprentice operates vertical mill



First-year apprentice shaping gear teeth at Warner & Swasey

Chucks and face plates (continued)
Truing the work—*chalk and toolholder methods.*
Truing finished work—*indicator method, use of soft hammer and copper shims.*

Finish turning between centers
Checking centers and center holes: *recentering to enlarge or correct center holes.*
Finish turning: *importance of honing cutting edge.*

Facing
Facing ends and shoulders.
Facing ends between centers: *selection of tools, split (relieved) center for finish facing, feed down for rough facing, feed out for finish facing.*
Facing shoulders: *multiple tool set-ups.*
Use of wire gage.
Facing work in chuck.
Chamfering and filleting—*radius tool and radius gage.*

Taper turning
Offset tailstock method: *computing and measuring offset, importance of having tool on center, testing the taper, finishing taper, crowning of pulleys.*
Using taper attachment: *advantages over offset method, computing taper per foot, setting the taper attachment—using standard plug between centers and dial indicator, importance of taking up backlash before cutting; testing taper; micrometer method, gate method—taper ring gage, use of protractor; using compound rest, setting compound rest, measuring angle of taper with vernier protractor; setting form tools to master plugs, importance of rigidity, uniform feed, minimum backlash and constant lubrication, tightening the slide.*

Spotting for steady rest support
Light finishing cut to obtain roundness, checking roundness with micrometer.

Knurling
Methods for adjusting tool, use of paper.
Importance of clean tool and copious lubrication.
Keeping knurl on work until cut is finished.

Lathe filing
Filing left-handed to clear dog or chuck.
Chalking and oiling file to prevent pinning.
Watching centers for burning.
Keeping safe edge next to shoulder of work.

Polishing in lathe
Use of oil, protecting ways from grit.
Loose centers to accommodate expansion of work.
Hazards—*abrasives winding around work, injured fingers, etc.*

Miscellaneous operations
Eccentric (crankshaft) turning: *methods of centering—layout and drill in drill press or lathe, drilling in milling machine, toolmaker's buttons, crankpin fixtures, test indicator; meaning of "throw," methods of holding work—between centers, dog tied to prevent swinging from center, on face plate and in chuck.*
Spherical turning: *cutting concave surface with radius tool, cutting spherical surface with radius bar clamped to lathe bed, use of ball turning rest.*
Forming irregular shapes: *types of form tools, grinding and mounting form tools, checking with templet, cutting grooves and T-slots—grinding and setting tools, trepanning operation, chucking.*

Drilling in lathe
Placing job in chuck or on centers, using steady rest; use of hold-back clamp and belt lace.
Placing drill in tailstock.
Lathe tools for centering.
Drill holes—*for cored holes, "borespot" with boring*

tool to start drill central; use of flat drill, deep hole drilling—work rotated at high speed using fine feed, use of gun-barrel drills.

Boring in lathe

Mounting work same as for drilling—*tool on or slightly above center, importance of rigidity of boring tool—using largest possible tool, clamp tool as short as possible, avoiding "bell-mounting," keeping chips clear; testing with plug or with micrometer and inside caliper.*

Taper boring: *taper attachments, compound rests, testing taper with plug gage or protractor, importance of having tool on center when cutting.*

Chambering and back facing—*undercutting, marking tool for length of cut, use of micrometer dial and carriage stop.*

Reaming

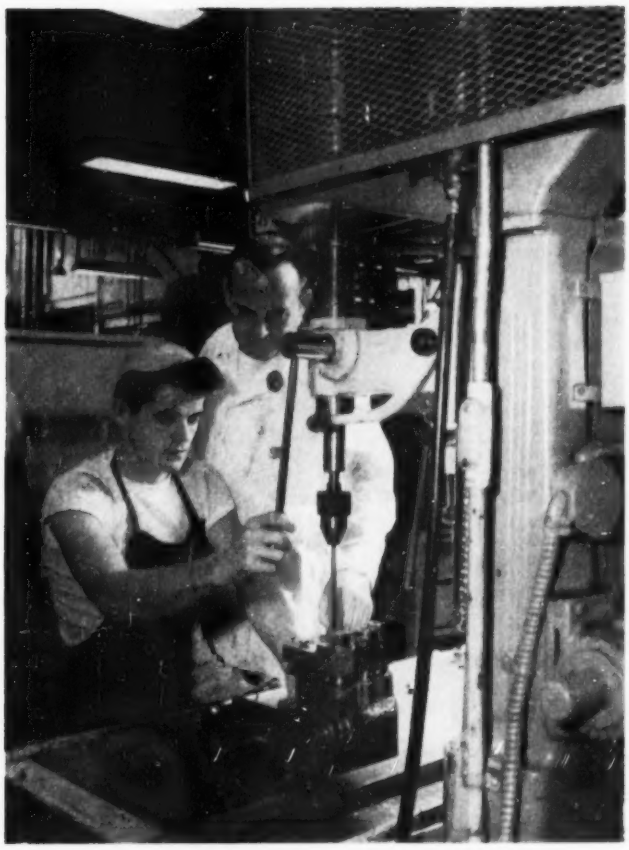
Importance of keeping reamer against tail center.

Importance of lubrication and chip removal.

Straight reaming by power: *slow feed, floating holder.*

Taper reaming by hand or by slow speed: *use of tap wrench, skeleton reamer.*

Spotting outside true with taper hole: *taper test bar and steady rest, picking up center true with spot, chamfering holes for turning.*



Supervisor looks on at North American Aviation, Inc, as apprentice operates drill press

Tapping in lathe

Thread selection to prevent stripping.

Hand tapping for blind holes.

Machine tapping.

Cutting off stock.

Importance of: *rigidity, minimum backlash, constant lubrication and uniform feed to prevent chatter and gouging.*

Side clearances to prevent binding.

Thread cutting in lathe

Cutting external V-threads: *gearing lathe; grinding tool and mounting in on center, use of center gage, engaging lead screw, thread chasing stop, thread chasing dial for closing split nut, constant lubrication and optimum feed to prevent gouging and glazing, allowing for backlash, use of compound rest, resetting the tool upon breakage, measuring threads with gage—thread micrometer, wires, etc.*

Cutting external square threads: *using angle of helix to determine side clearances of cutting tool, roughing thread with narrow tool, finishing thread to size—importance of using flat-topped tool and keeping top in line with axis, use of side face tools for course pitches, burring thread before measuring.*

Cutting multiple acme threads: *acme threads vs square threads, cutting left-hand threads—use of tumbler gears, indexing for multiple threads, grinding the tools—use of acme threads, grinding the tools—use of acme thread gage, and improvised template for side clearance.*

Roughing threads with square nose tool.

Cutting acme threads to gage.

Setting the tool—*use of thread tool gages.*

Cutting on one side at a time to avoid gouging—*use of compound rest.*

Cutting on both sides—*finishing, use of spring (goose-neck) tool.*

Internal thread cutting: *boring hole to root diameter plus clearance, grinding the tool—error in thread angle corrected with finishing tap; marking length of cut on tool, allowing for spring of tool, use of micrometer dials and thread-chasing stop, keeping hole free of chips, resetting the tool, finishing thread with a tap—use of tailstock center for alignment, cleaning threads and measuring.*

Turning—Turret Lathe

Classifications

Horizontal: *ram type—all-geared head, electric, plain and universal; saddle type—fixed center, cross sliding, compound; bar and chucking machines.*

Basic machine elements

Headstock sequence of development: *(1) single pulley, (2) step pulley, (3) back gears, (4) all-geared head.*

All-geared head: *six-speed heads—three levers—forward and reverse, triple gear, hi-lo clutch; twelve-speed heads—four levers, forward and reverse; left-hand double gear, right-hand double gear, triple gear.*

Pre-selector.

Clutches: *cone friction, pullmore, twin disc.*

Bearings.

Cross slide sequence of development: *(1) plain, (2) plain with hand longitudinal adjustment, (3) universal; types of cross slide—side-hung type, reachover type, feed trips and stops—power cross feed, longitudinal feed; square turret—fixed on side hung slides; cutters mounted by means of rockers (solid type square turret—ram and saddle machine), and shims (open type turret—saddle machines).*

Basic machine elements (continued)
Hexagon turret: *ram type (fixed saddle—sliding ram), saddle type (sliding saddle).*
Feed train: *parts—head end gear box, changing gears to double or halve feeds (ram), Hi-lo lever (saddle), feed shaft, carriage apron, saddle apron.*
Rapid traverse to move heavy hex turret and saddle by power.

Turning—Turret Lathe Tooling

Speeds and feeds
Surface speeds and feeds—*variance with each job.*
Ultimate selection by: *color of chip, feel of machine.*
Factors influencing choice of speeds and feeds: *work piece—material, type of chips produced, abrasiveness, frail or heavy design; coolant; cutters—type and cutting angles; rigidity of tooling setup, quality of finish, quantity in lot, cutters, drills, taps, form cutters, cutoff cutters, counterbores.*

Grinding and setting cutters
Materials used for cutters: *carbon steel, high-speed steel, stellite, carbides.*
Size of cutters.
Cutter grinding: *clearance angles—back rake, side rake, front clearance, side clearance; large wedge angles, small wedge angles.*
Chip control: *combination of back and side rake angles, curling grooves.*
Advantages of using coolant.

Machining operations
Turning: *bar turners, roller turners for continuous chip materials, "V" back turners for short chip materials; tilting cutter in roller bar turner for greater rigidity, longer cutter life; setting.*
Steady rest rolls—*behind cutter for accurate burnished finish, ahead of cutter on another diameter to establish concentricity; setup sequence for roller turner.*
Factors determining quality of finish.
Drilling: *how drill is started, material drilled, feed and speed used, grinding of drill, coolant, condition of machine, drill and holding socket; types of drills—two-lip twist drills, core drills, combination and dual-cut drills, straight flute drills, special drills; drill grinding.*
Boring: *forged cutters, tool bits; stub and piloted boring bars; taking boring cuts from hex turret.*
Adjusting boring cutters three ways: *(1) with adjustable holder, (2) with slide tool, and (3) with screw arrangement.*
Reaming: *proper preparation of the bored hole prior to reaming, reamer alignment, reamer ground to suit material, proper start for reamer, reamer lubricant or coolant; types of reamers—rose chucking reamer, solid finishing reamer, multiple-blade reamer, block type reamer.*
Forming: *three types of form cutters—forged cutters, dovetail cutters, circular cutters.*
Threading: *types of taps and dies—solid, solid adjustable; collapsing taps, self-opening die heads (pull-off trip, outside trip, inside trip).*

FITTING, ASSEMBLING & ERECTING (1000 Hours)

Benchwork

Use of common handtools: *steel hammers, soft hammers, screw drivers, wrenches, hacksaws.*
Laying out work: *tools, scribing lines, marking solutions, laying out, compensating for previous errors.*

Quarterly Apprentice Report

(Suggested Form)

Original to be sent to Parent or Guardian
Copy to Apprentice

LEGEND
Grade 1 - Exceptional
Grade 2 - Good
Grade 3 - Fair
Grade 4 - Poor

Clock No.

Quarter Ending

NAME

DEPARTMENT

Apprentice Supervisor

Chipping
Cold chisels and their uses, grinding the chisel, hints on chipping, controlling the cut, hazards in chipping, chipping with pneumatic hammer.

Files and filing
Kinds of files—*single and double-cut files, coarseness.*
Shapes of files—*flat, mill, round, three-square, barrette and others; safe edge—its purpose; convexity of files.*
Care of files.
Holding the file.
Filing operation—*chipping off cast-iron scale before filing, crossing the stroke, importance of proper height of work, drawfiling, graining the work, filing soft metals.*
Power-driven rotary files.
Reciprocating filing machines.

Key fitting
Preparing mating members before fitting key.
Threading attachments: *leader and follower attachment—applications, limitations, use where a limited range of short length threads are to be cut single point, or where taps and dies are to be led on for lead accuracy; furnished for saddle type carriage and saddle apron and for ram type carriage apron only.*
Lead screw attachment (saddle type): *components—head-end gear box, selective gear box, independent lead screw, motor-driven quick traverse, half-nut boxes, control lever.*
Taper turning—*three methods of producing tapers on turret lathes: (1) with forming cutters, (2) with roller rest taper turners, (3) with taper attachments—when to use each.*
Direction of feed for accurate taper cut—*direction of cutter back pressure, movement of cross slide required to produce taper.*
Maintaining and duplicating accurate sizes: *using the taper attachment in connection with other tools in a setup.*

New apprentice (left) receives instruction on a milling machine from supervisor at Convair San Diego

Work holding devices
Collet chuck (parallel closing type): *adjustment, application in first operation work and in second operation work.*
Spring-type collets—pushout collet; *drawback collet.*
Stationary collet.
Arbors: *expanding bushing type, expanding plug type, threaded type.*
Hand-operated chucks: *universal type, combination type.*
Power-operated chucks: *wrenchless type, power chuck wrench type, air and hydraulic type.*
Chuck jaws mounted three ways: *(1) tongue and groove, (2) slip jaw, (3) step-along—first operation jaws, second operation jaws, chuck jaws for long work, chuck jaws for frail work.*
Special fixtures and steady rests: *face plate fixtures, pot fixtures, angle fixtures, indexing fixtures—rotating, swinging, or combination types; steady rests—self-centering, closed ring, open types.*

Tooling principles
Balancing setup time, work handling time, machine handling time, and actual cutting time.
Keeping work handling and chucking costs down.
Reducing machine handling time.
Reducing cutting time.
Fitting straight keys to shafts: *filing key in keyblock, driving key in position, fitting other member, compensating for misalignment of keyways.*
Fitting straight key in hole, use of keyseater.
Fitting dovetail keys to shafts.
Fitting woodruff key: *preventing swelling of shaft.*
Types of keys and tolerances.
Spline fitting, fitting to gage, types of splines.

Hand tapping
Tapping normal to surface when starting—tests.
Tapping blind holes.
Spotting, tap-drilling and tapping.
Removing broken tap.
Sharp taps and proper wrenches: *use of tap extensions.*
Lubrication and tapping.
Tapping tapered pipe threads.
Die-cutting external threads.

Dowel fitting
Fitting straight dowels: *measuring diameter, methods of fitting, use of oil.*
Fitting tapered dowels, use of hand reamer.
Drilling straight dowel holes in line: *reaming to correct alignment, care in using portable drill, leveling.*
Drilling and reaming tapered dowel holes.

Polishing with emery cloth
Order of applying emery cloth, grating, lard oil.
Polishing in lathe: *methods of holding emery cloth, hazards.*

Straightening
Straightening press and bench centers.
Arbor press.
Straightening slender bars between lathe centers.
Straightening on anvil.

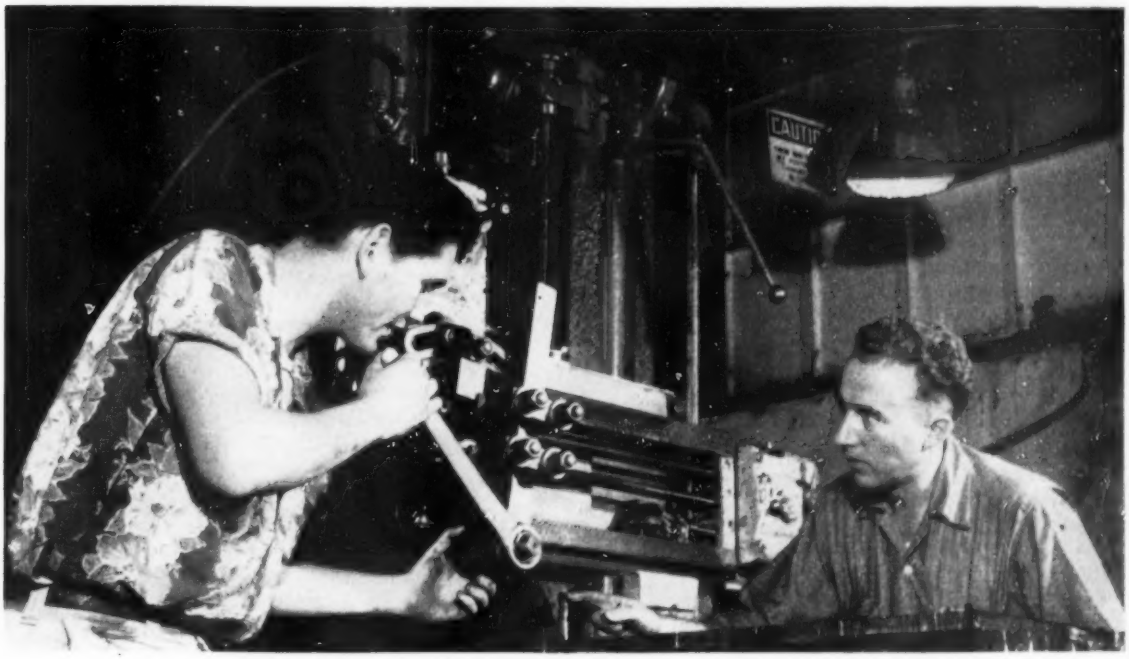
Peening and riveting
Peening metal, stretching by hammering.
Riveting: *use of rivet sets, hot or cold riveting; blush riveting.*

FITTING, ASSEMBLING AND ERECTING

Assembly

Assembling screws
Cleaning out holes: *removing broken screws and studs, use of Ezy-out, annealing and drilling out; fits for screws—threads and loosening.*

Assembling bushings
Driving bushing in position: *checking sizes, lubricating.*



Assembling bushings (continued)
Testing hole after assembly—*reaming or scraping hole to size, care in fitting hardened bushings.*
Importance of proper clearances: *standard or basic hole practice, classification of fits, checking holes and shafts before fitting, interchangeable parts, selective assembly, squaring in bushings.*

Assembling ball and roller bearings
Seating of races: *checking with test indicator, checking diameters for size and roundness, testing alignment of races.*
Assembling the bearing: *bearing not washed before assembly—reasons, keeping bearing free from grit, driving bearing in position.*
Mounting ball bearings: *for radial load without thrust, for combined radial and thrust loads.*
Roller bearings: *anti-friction, plain, tapered; mounting tapered roller bearings—direct and indirect methods, taking up plays; assembling tapered roller bearings—pressing cups in position, testing seating, adjusting for free running.*
Lubrication of bearings: *consideration of operating conditions, purpose of lubrication, light vs heavy-body oils, causes for overheated bearings.*
Plain bearings—journal and housing: *importance of journal finish and uniform clearance, purpose of oil grooves, of oil rings; flat thrust bearings.*

Clutches and couplings
Types of clutches: *positive clutches—right hand and left hand; friction clutches, cone and disc clutches.*
Assembling clutches: *importance of true bearing surface, firm mountings.*
Couplings: *universal joints, knuckle joints, flange and clamp couplings.*
Friction brakes—band and disk types.

Cams
Classes of cam motion, types of cams—*use of rolls or studs, positioning of cams—computations.*

Assembling gears
Center distance and backlash.
Proper alignment of shafts—effect on wear.
Setting bevel gears: *pitch-cone apex, tapering teeth, obtaining proper tooth contact, fitting bevel gears.*
Worm gearing: *worm central with gear—testing.*

Miscellaneous assembly operations
Assembling pulleys: *checking alignment and runout, balancing.*
Assembling lead screws: *fits and alignment, care in handling, removing burrs and running in.*
Assembling units on ways: *preparing ways for assembly, aligning units and fitting gibs.*
Use of ropes, hitches and chain slings.
Use of portable drills.
Making parts oil tight.
Lubrication systems: *splash, pressure, gravity, flood (use of reservoirs); provisions for maintaining clean lubricant.*
Belting—*methods of connecting, adjusting tension, V-belt drives.*
Pipe assembly—joints and seals.
Use of sheet metal.
Soldering, brazing and babbitting.
Forging, lapping, patching chipped and porous castings; *painting—surface finishing, blackening and japanning.*
Hydraulic mechanisms: *driving and feeding mechanism; valves to regulate speed and direction; operation of valves, use of piston and cylinder.*

Application of hydraulic power
Pumps: *gear, vane and plunger types.*

Rotary hydraulic motor
Assembling hydraulic units: *testing for leaks; testing operation of valves, pistons, etc.*

Fundamental assembly work
Cleaning parts before fitting, keeping parts clean during assembly, removing burrs and blemishes.
Keeping tools in first rate condition—*using proper tools, mechanical judgment.*
Proper fit to suit application.
Fitted parts and standard parts—*classification of fits.*
Little or no fitting desirable—*reasons for some fitting.*
Correctly machined parts.

Inspection of machines—running off
Leveling up for inspection.
Use of test bars: *sweep test, alignments, runouts, etc.*
Testing alignment of flat bearing surfaces: *allowing for sag under working loads.*
Purpose of running off: *performance tests, adjustments preceding operation.*
Testing operation: *vibration reduction, speed and feed changes, accuracy of timing, safety of operation, spindle operation, vital bearing parts, lubrication and coolant supply.*
Visual inspection: *surface finishes, blemishes, corrosion and painting.*

TOOLMAKING
(1000 Hours)

Fundamental requirements
Ability to read blueprints.
Knowledge of measuring tools.
Knowledge of all machine tools.
Neatness and pride of workmanship.
Accuracy in a reasonable time—*judgment in approximate measurements.*
Constant care and adjustment of machines.

Toolmaking tools
Measuring tools and their uses: *vernier height and depth gages, straight edges and squares, fixed gages.*
Hand tools: *V-blocks, layout tool, scrapers.*
Cutting tools—*types and uses: drills, reamers, taps and dies, milling cutters, and boring tools.*

Locating and boring holes
Use of size-blocks: *locating and adjusting to correct center distances.*
Use of toolmaker's buttons: *setting buttons in position, setting cutting tools concentric with buttons, use of test indicator and of "wiggler."*
Using the milling machine screw.
Use of discs for small work.
Master plate or transfer method.
Use of jig boring machines—*boring bar and boring tool, adjusting and setting of cutters.*

Locating the work
Checking center distances—*chordal dimensions and coordinates for circular spacing, use of dividing head.*
Locating and boring oblique holes: *use of angle plate, spherical buttons, plugs and height blocks, and universal milling machine.*

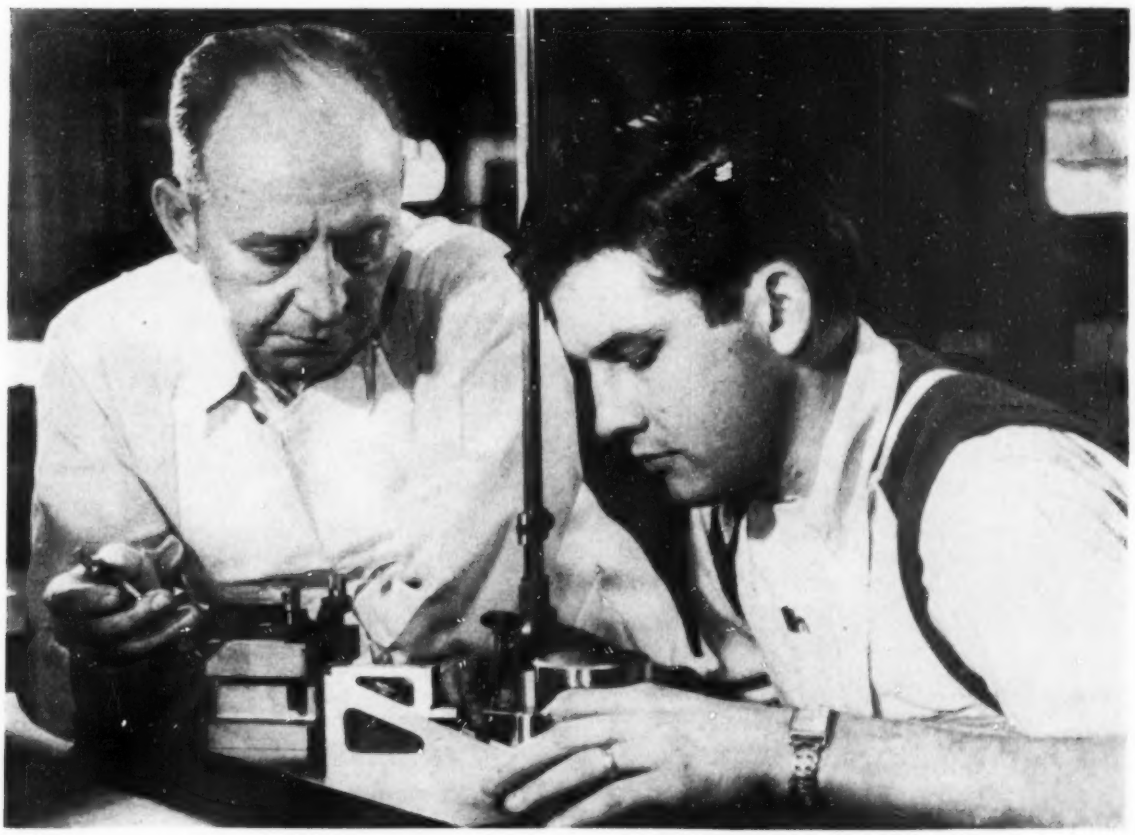
Jig and fixture work
Welding jigs and fixtures.
Advantages of standard parts.
Types of drill jigs: *plate or templet, open, closed or box, trunnion, and indexing types; how jig should be used, jig construction, milling the jig, value of flat and square locating seats; jig bushings—fixed and removable, fitting bushings and sizing holes.*
Milling machine fixtures: *points to consider, types, vise jaws and vise fixtures, profiling fixtures.*

Making small cutting tools
Milling a twist drill—*setting up the spiral head.*
Milling counterbores and countersinks.
Making reamers: *increment cut and helical teeth, use of pilots, proper clearances for grinding.*
Making milling cutters, backing off.
Flat forming tools: *making and use of fly cutter.*
Circular form tools.
Broaches, taps and dies.
Grinding of various cutting tools.

Punch and die work
Die, punch and stripper plates.
Making the die.
Punches—*machining and fitting.*
Cutting edges beveled for shearing action.
Types of dies and their uses.

Gages and gagework
Measuring and fitting: *tolerance, limit and allowance; classification of fits—loose, free and medium fits; snug and wringing fits; forced (pressed) fits; shrinkage and expansion fits; methods of fitting, classification of gages.*
Gagemaking: *selection of material and treatment, making plug gages—lapping centers and cylindrical surfaces, tapered plug gages, lapping and measuring; making ring gages, fitting to master plug, precautions to avoid bell-mouthing.*
Making thread gages: *hardening without undue distortion, grinding and lapping gages, measuring with wires.*
Making flat gages: *methods of grinding, lapping edges or points; flush pin and special gages, wear of gages —tolerances, importance of smooth surface, hardening and chromium plating.*

Lapping
Lap softer than work—*reasons, function of lubricant.*
Movement of work relative to lap, *changing path for uniform abrasion.*
Lapping flat surfaces: *use of rigid cast iron lap or plate; finish lapping—use of plain plate—lapping compound and lubricant, rubber after dry, consideration of temperature.*
Lapping outside cylindrical surfaces: *use of split ring.*
Lapping holes: *brass and cast iron, lead laps for fine finish, procedure and requirements—precautions against bell-mouthing, preventing grooving.*
Lapping center holes: *use of copper center—avoiding grooving.*



Toolmaker and apprentice at Ford's Aircraft Engine Division, Chicago

Preparing the lapping mixtures: *suspending abrasives in oil, grading the abrasives—in oil, lubricants for lapping.*
Use of diamond powder: *rotary diamond lap applications; charging the lap.*
Machine lapping procedure and applications: *function of work holders (spiders).*
Preparation of parts for lapping.

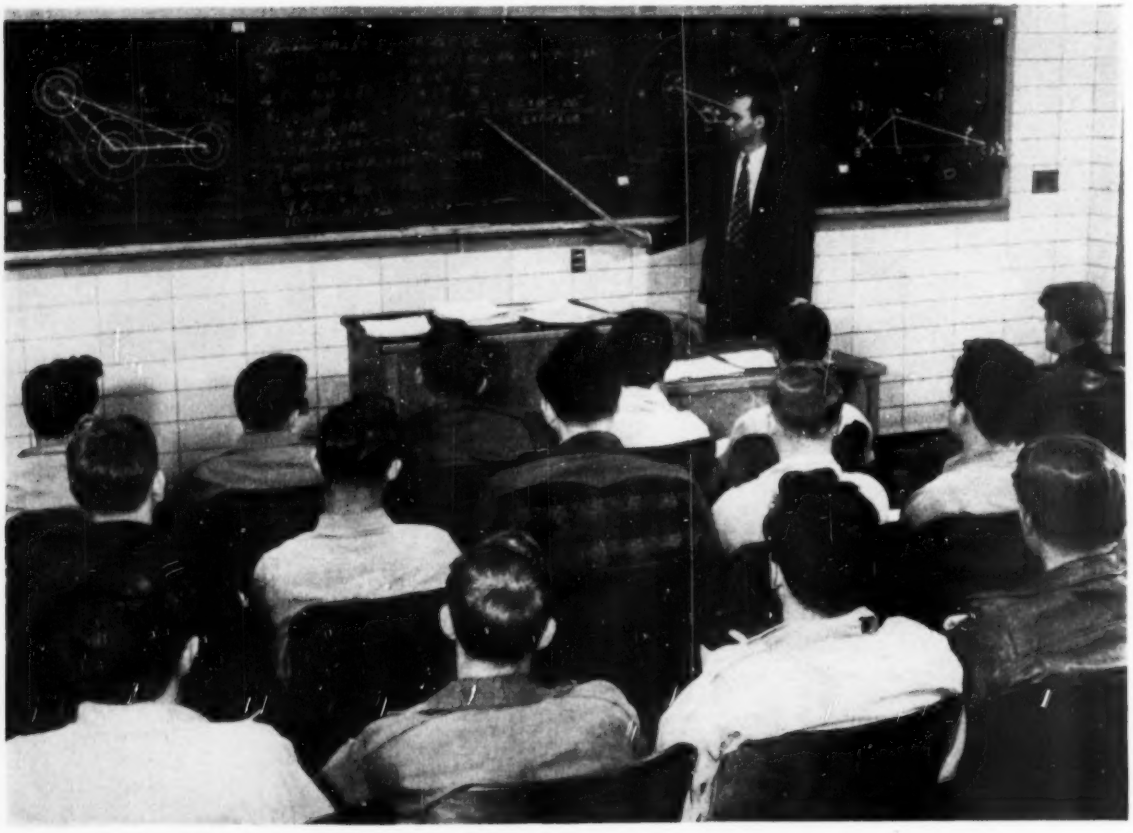
Oilstones and their uses
Natural and artificial oilstones.
Keeping clean and moist; *surfaces of stone flat.*

Precision measurements
Measuring tapered parts and angles: *limit gages for standard tapers, setting gage by use of discs or with standard plug, cylindrical plugs to measure external tapers, balls to measure internal tapers, plugs in angular measurements, laying out angles—use of rectangular coordinates, bevel protractors, sine bar computations—height gage and precision gage blocks, measuring angles and tapers; use of sine bar fixtures.*
Precision gage blocks and their application: *wringing together, uses for gage blocks—determining combinations, as comparators and with fixtures.*
Inspecting tools with test indicator.
Use of microscope in toolroom; in layout work.
Use of the comparator for testing profiles.
Measuring with light waves: *optical flats and one-color light, testing flatness-bands and micro-inches, principle of wedge of air, measuring lengths—use of standard gage blocks.*
Surface finish: *indicating surface roughness (micro-inches), measuring with profilometer.*

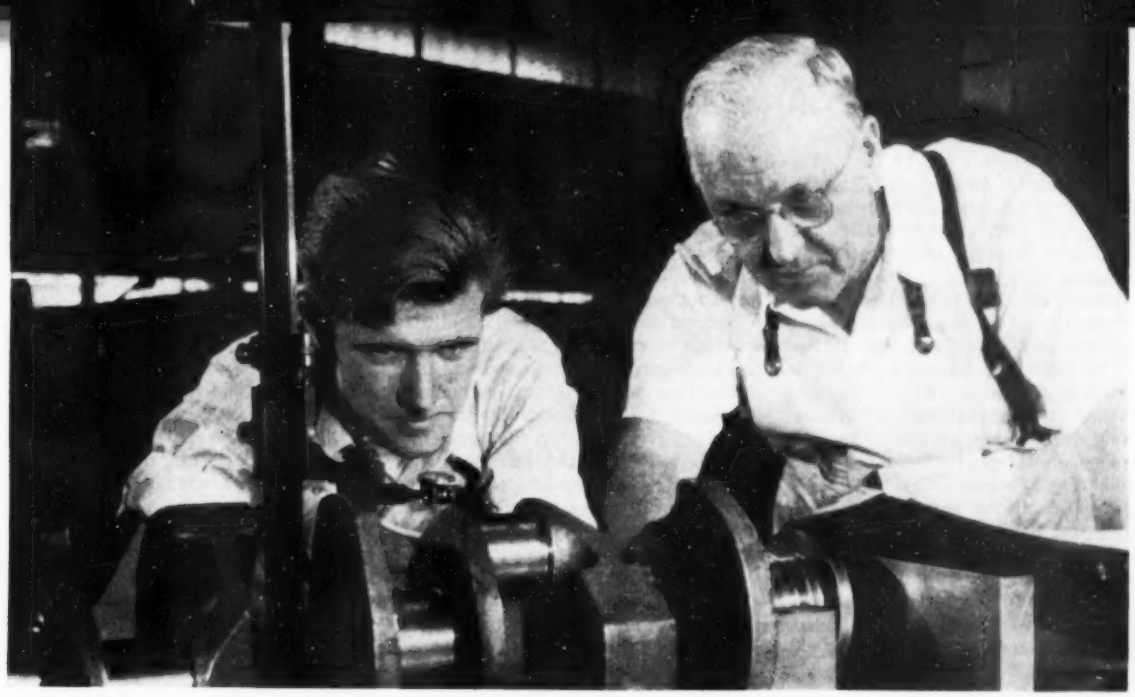
Steels and alloy steels
Carbon steel—*effect of amount of carbon in steel; measuring of 90-point carbon.*
High-speed steel—*"red-hardness," meaning of 18-4-1 high-speed steel.*
Other alloys for cutting: *cobalt tungsten steel, stellite and carbide tools; functions of alloying elements.*

Ford Motor Co apprentice picks up some pointers on gaging crankshaft dimensions

the way is long...



Classroom instruction at Ford Motor Co, where "skull sessions" are interspersed with in-the-shop training



the road is rough...

tool and diemaker training

The foregoing essentials of shop training recommended by the National Machine Tool Builders' Association are applicable to tool and diemaking apprenticeships as well as to training for the machinist's trade. This 6000-8000-hour course can serve as a well-rounded pre-tool and diemaker curriculum in areas where tool and die apprentices are first required to complete machinist apprenticeships.

Typical of such area requirements are those of the Texas Joint Apprenticeship Council for Machinists. Under Texas standards, the toolmaker apprentice must first complete 7500 hours of an 8000-hour general machinist apprenticeship. Then he must spend about 1800 hours on general toolmaking, 400 hours on tool design and layout, and 300 hours on metallurgy and heat treating. Total tool and diemaker training thus involves approximately 10,000 hours.

Although the practice of requiring a tool and die maker to first complete machinist training is widespread, exceptions exist, particularly in large companies that can afford to have an entirely separate 8000-hour course, emphasizing toolmaking aspects of metalworking and with less stress laid upon machine operation.

Lockheed Aircraft Corp's Georgia Division, for example, has separate apprentice machinist courses and apprentice tool and diemaker courses, both of approximately 8000 hours' length. The tool and diemaker program cuts down drillpress training by 80 hours, lathe work by 1160 hours, shaper and planer work by 80 hours, etc. Some machinist training is altogether eliminated.

But Lockheed's tool and die maker training embraces several metalworking phases not included in machinist training and lays considerably more stress and time on such subjects as benchwork, dies, jigs and fixtures; kirksite and double-acting dies, tool design and tool inspection.

Such full-time tool and diemaker courses are, however, more or less confined to firms large enough to support more than one apprentice training course at a time. Generally, the practice is to have a man first complete the machinist's course, then take one to two years of special and diemaker training in order to qualify as a journeyman in the latter trade.

NTDMA Survey

The National Tool and Die Manufacturers' Association recently launched an intensive survey of apprentice training methods in the industry. More than 700 member NTDMA companies are being asked such questions as (1) are you now training apprentices? (2) how many men are you training? (3) are you training specialists in machine-tool operation? (4) how do you select apprentices? (5) do you require aptitude tests? (6) do you draw apprentices from trade and technical schools?

When the answers are in, NTDMA will have powerful ammunition in its campaign to make training methods more effective and to stimulate public and industrial interest in extending tool and diemaker apprentice training.

Short-Term Training

In addition to formal, long-term machinist and tool and diemaker apprenticeships, many organizations and individual companies have developed short-term "learner" programs tailored to the needs of their particular industries. These are designed to provide quick basic instruction in the particular job for which a man is hired.

Here again, the National Machine Tool Builders' Association has been active in recommending training practices. In its Training Standards Committee report of April, 1953, "Key to Survival and Growth—Training Methods for Use in the Machine Tool Industry," NMTBA offers three learner training methods.

In the first of these, a drillpress learner, for example, spends each morning of his first week in an in-plant classroom, and the afternoon in his own department in on-the-job training. His classroom work covers blueprint reading, use of measuring instruments and gages, and learning decimal equivalents. If at the end of the week, the new employee proves unsatisfactory he (1) receives further special training, (2) transfers to another department, or (3) is separated from the company.

NMTBA's Learner Plan No. 2 lasts two weeks, with four hours each day spent in the classroom, the balance in the shop. Classroom training is divided into 20 hours of blueprint reading, 10 hours of precision measurement practice and 10 hours of miscellaneous instruction. Special films are used in teaching blueprint reading and measurement principles.

NMTBA Learner Plan No. 3 takes anywhere from two days to two weeks, depending on the man and the nature of his job. Here, all work is done in a training room equipped with lathes, turret lathes, drills, grinding and milling machines.

New employees go directly into the training room, which is staffed with full-time instructors. As soon as the instructors consider a man sufficiently trained to fill a particular job, he is transferred to that department.

Purpose of NMTBA learner plans is twofold: (1) to make a productive worker out of a new employee in the shortest possible time, and (2) to screen out inept new employees.

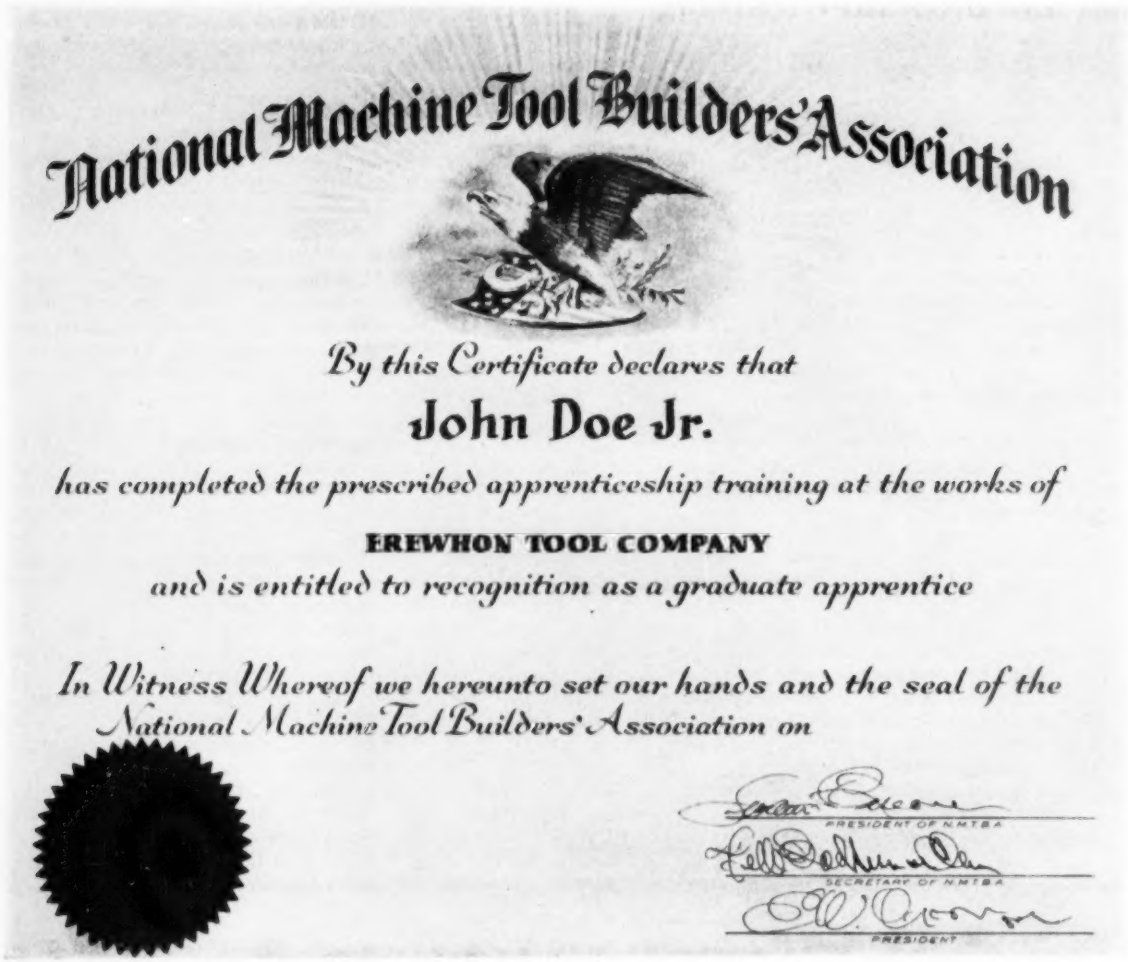
The efforts of the National Machine Tool Builders' Association, National Tool and Die Manufacturers' Association, of federal, state and area groups, of trade unions, and of individual companies are helping to drag apprentice training out of the "horse and buggy" era into the light of modern practices.

But, as W F Patterson, Director of the Department of Labor's Bureau of Apprenticeship, told a recent meeting of the Metal Trades Department of the AFL:

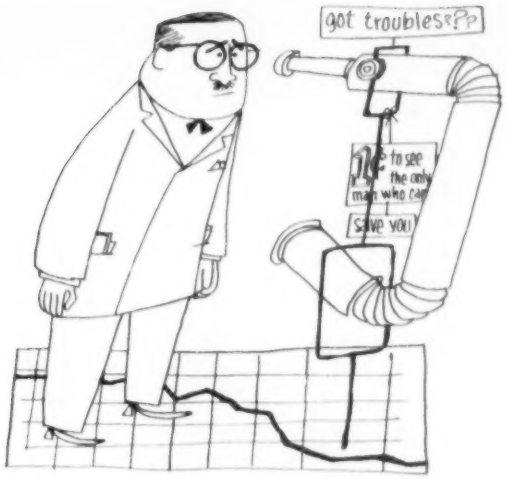
"Technological progress has created new and highly complex skilled crafts, and added so many new skills to old crafts as to alter them greatly. Closer tolerances, finer finishes, more intricate design, more complex wiring and the use of finer equipment and materials have placed a premium on the thorough training of today's skilled worker.

"The time has come when those responsible for the nation's industrial training programs must discard many of their traditional views and take an entirely new look at apprentice training."

but it leads "From Here to Security"!


National Machine Tool Builders' Association
By this Certificate declares that
John Doe Jr.
has completed the prescribed apprenticeship training at the works of
EREWHON TOOL COMPANY
and is entitled to recognition as a graduate apprentice
In Witness Whereof we hereunto set our hands and the seal of the National Machine Tool Builders' Association on
PRESIDENT OF N.M.T.B.A.
SECRETARY OF N.M.T.B.A.
PRESIDENT

So you're short of capital?



Find working capital in your own organization by tightening up the loose spots in your business practices

BY GEORGE S ODIORNE, Management Training Staff, RUTGERS UNIVERSITY

"I had my own shop, but I had to sell out to a big company. Didn't have enough capital."

The speaker was manager of a plant which he had formerly owned, but which he now managed for its new owners as a wholly-owned subsidiary. Further discussion revealed that the parent company never put much new capital into the plant, after purchase.

"I never really understood why, but they got away without sinking much more into the place beyond the purchase price. I guess it's just that they have the backing if it is ever needed."

This manager was relatively lucky. Not every small company in financial hot water is able to sell out, and find a good job for the former owner to boot. More often, the small company which has chronic capital-shortage problems joins the casualty list, which last year amounted to 15% of all businesses. Post mortems of these financial corpses reveal that many of them die for reasons other than simple shortage of cash. In many cases the small-business owner who is highly skilled in the engineering and mechanical aspects of his business shows a gross lack of understanding of his tribulations.

Analysis of some of the financially soundest small firms indicates the following general traits:

1. **Close inventory control.** They do not tie up capital in raw materials beyond requirements, but schedule deliveries as close as possible to date of manufacture. Finished products move out very close to the promised delivery date. Products which have to be made ahead are stored in public warehouses, so that a warehouse receipt is on hand as collateral for a short term note, if needed.

2. **Sound production control.** The movement of materials into and through the plant is planned in detail, to reduce excess time. Because time means increased inventory investment, reducing manufacturing time reduces investment.

Close production control requires motion-study techniques, flow process charts, and mechanized materials handling where possible. It also involves control over layout, full utilization of space, and tighter machine scheduling.

3. **Disposal of excess facilities.** Low-revenue-producing equipment is a drain on capital. If study shows that a line is too highly seasonal or otherwise fluctuates, the financially taut firm either finds new business for the equipment or gets rid of it. Reputable manufacturers' agents can be useful in filling idle capacity in many cases. If the low-revenue product is occasionally required in your own manufacturing processes, it might be better to sell the equipment and purchase the product.

4. **Proper maintenance.** Poorly maintained equipment will eventually be out of service so much that it will be a drain on capital. If breakdowns caused by faulty maintenance keep 10% of your machines out of production, your working capital has been reduced by one-tenth. In one plant recently visited by the writer, one machine out of five was continually out of service. The boss, while complaining about a shortage of working capital, also declared that he could not afford systematic maintenance. *If your machines aren't running, your capital isn't working.*

5. **Good accounting practices.** If you plan to borrow money, banks will demand accurate and complete financial statements. A sound accounting system, even though a simple one, should tell the boss just what it costs him to make and sell his product. It isn't enough to make a product for a dime and sell it for fifteen cents, if your overhead and selling expenses are eight cents. Furthermore, simple cost records should indicate costs for each operation, where losses are occurring, and upon what basis prices should be set. Prices not based on accurate cost information can be a drain on capital.

In 1953, of all years, more business firms are facing the hard facts of rising costs and stable prices. In an inflationary period it has been easy to protect capital depletion by passing all costs off to the customers. The substitute to this happy situation must be cold scrutiny of operations to be certain that no drain on capital is taking place.

The small business which has incorporated all of these practices into its operations generally finds working capital without trouble, but that company probably doesn't have capital-shortage problems, anyhow.

TRUTH PARTY

• Will an "evaluation committee," composed of three workers on the production floor, be a good way to judge new workers?

Such a committee might serve its purpose, but it is not fair. Workers are not being paid to take the responsibility for success or failure of the hiring process. That job is divided between the foreman and the personnel department.

If such a "truth party" were allowed to be started, it might easily be the "camel's nose inside the tent" leading to union hiring and firing, and loss of management's prerogative in this respect.

STUMP SPEECH

Do production workers have the right to argue politics at work?

If the conversation is an honest effort to find answers to pressing political questions, which is rather rare, then a certain amount of talk is in order. In fact, it is impossible to stop. But when the talk of politics is either an effort to avoid work, or paid political agitators trying to make trouble or influence the workers' votes then this is too much, and the talk should be limited.

A general rule is that if the talk continues during normal work, and work does not suffer as a consequence, it is just as well to let it go. If the men stop their work, and engage in heated conversation, then the foreman has the right and duty to put an end to it and tell the men to go back to work.

There is a certain amount of reader opinion that a company has the obligation to teach the men basic political facts, to go along with the electioneering in which unions frequently indulge.

POWER OF SUGGESTION

• Should foremen be allowed to receive payment for suggestions made under suggestion plans?

Those who feel that foremen don't deserve suggestion-plan payment, say that a foreman's job is to improve methods, among other things, and, if he were paid for suggestions, he would be receiving double payment for his job. Also, there is a chance that foremen would usurp suggestions made casually by the men, and receive credit the workers deserve. The men would feel they were bucking too strong a tide, and the entire suggestion system might be endangered. Also, foremen, being part of management, would be getting money for the same kind of work that higher-ups do as part of their daily work, especially if the suggestion is an improvement on a method the foreman himself initiated.

On the other hand, there is the argument that anyone who helps a company save money should share in the company's savings. Those who feel that foremen should get some sort of reward for their suggestions say that there might be some kind of intermediate profit-sharing, to replace the direct suggestion-plan payment.

There is another strong reason to include foremen in suggestion plans; that is, that workers are paid incentive bonuses to raise their production. This is payment for their regular work, plus payment if they do their work better or faster. Thus, foremen deserve an incentive plan to stimulate them to do their work with greater interest.

VARIETY SHOP

Is it better purchasing practice to buy all machines of a certain type from one manufacturer, in order to save on maintenance and spare-parts inventory?

There are many advantages to such a program. Maintenance, spare-parts inventory, fixture interchangeability, operator interchangeability, are all made less expensive. However, a purchasing agent who buys in this manner is exposing himself to certain risks. For one thing, machine-tool design progress is spasmodic, and each company tends to go through

HANDLE PEOPLE

A number of companies have been using *AM* Round Table narratives and reader comments as the basis for management-training discussions. To aid them, and you, we here summarize selected ones from our issues of the past three years. Additional such summaries will appear in our 1954 Production Planbook, the next copy you will receive

waves of making improvements and then standardizing the product. If you happen to have just purchased all your machines of a certain type, and another manufacturer comes out with major improvements in design, you are not in a position to take advantage of these improvements. Also, certain shops are more suited to standardization than others, especially those plants where the product does not change often, and high production runs are common. Where jobs are one-of-a-kind, it would be impractical to buy all machines of one maker, because (on the theory that you don't shoot bears with a .22) no one machine can do everything.

Even if it is decided to standardize on one machine, it is not a good idea to hurry the decision. Extensive tests should be run to find just the right machine.

LAST OF THE MECHANICS

Is it appropriate for a toolmaker to dress in the manner of the toolmaker of the past, who wore immaculate clothes, even on the job?

The impressive thing about the old-time toolmaker was the way he did his work, more than the fancy clothes he wore. Our readers felt, generally, that the type of toolmaker which existed thirty or forty years ago is fast becoming extinct. This is unfortunate, and it's remotely possible that, if someone in the toolroom were to start wearing the clothes of, and working in the same way as, the old-time toolmakers, it might inspire the others in the shop to improve their attitudes, and increase their efforts to match the spirit of the old-timer.

The essential characteristics of the old toolmaker were universal skill, precision, independence, integrity, and refusal to submit to regimentation. Most of these qualities are not in much demand now, but there are some places, of which the small toolroom is one, where such traits are valuable. There must be some compromise with present-day reality, so that anyone considering such a course of action would have to try to match these characteristics with current practice, keeping the best essentials of both the ideal and the necessities of reality.

WHEN THE CAT'S AWAY

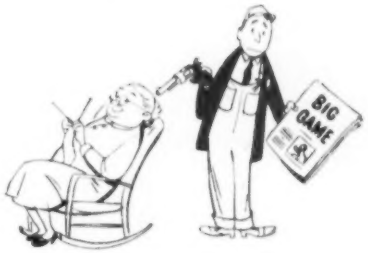
If a toolroom foreman is absent from his job on business, and one of his men makes a part contrary to design, but apparently better than the original, is the man at fault?

There is a classic argument between those who feel that the toolroom is a sort of annex to the design department, and should make everything according to the print, whether it seems right or not; and those who maintain that a toolmaker is a specialist who should merely be told what sort of part is required, and the toolmaker then goes ahead and designs and makes the tool.

Attitudes toward the question under discussion will depend on which side of the argument is being presented. Those who feel that the toolmaker was correct feel that the company saved money, the toolmaker employed his skills, and no harm was done.

On the other hand, the design department is being paid to make tool designs, and the designer should know why every line is put on the drawing. If the toolmaker uses his ingenuity, he also runs the risk of making a tool which won't do all its job, because tools often have to be made in what seems like the wrong way, in order to fit a special fixture, or so that the tool can do two or three different jobs.

The best answer seems to be that the change, if correct, should be made, but with the full consent and knowledge of the design department. This would be a policy matter, to be worked out between the heads of the several departments and publicized for everyone's good.



PLAY BALL

Is it fair to ask for a day off on the opening day of the baseball season?

To let the entire shop off on the opening day of a baseball season is too extreme. However, there may be a compromise which will let the men enjoy their sports and still not interfere seriously with production.

One suggestion is to allow a certain percentage of the men, perhaps 10%, the day off, the men to be chosen by lot, with the hope that others would not also play truant and spoil the system.

Some readers felt that any such time off would be excessive, and that once you start such allowances, there is no limit to what will be demanded, on the basis of your precedent. (Also, it was felt that the men got more pleasure out of truancy than they did out of baseball, and any time off would not be used for the stated purpose of baseball.)

Some firms, particularly small organizations, make some arrangement to give the men special sports treats. One such firm takes the entire plant to see a night game during the season when such a game will not interfere with production. Toward the end of the afternoon, the employee attitude is happy anticipation, and work gradually slows down (as it does almost every place just before a Christmas party). The fun begins, and by the next day the men are ready to go back to work. This sort of outing,

which does not interfere with normal production, repays the company well in increased loyalty and the feeling of identification which the workers develop with the company.

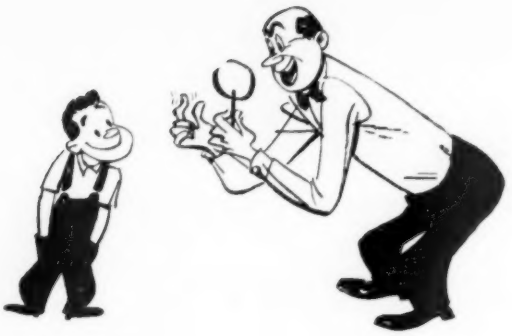
SHOP VEEP

Should a foreman assign one of his better men to answer questions about methods, if the foreman is too busy to do so himself?

Success of an assistant for the foreman will depend on the sort of person the foreman chooses for the job. There are several types of people to avoid in the selection.

First, the man chosen should not be a "yes" man, whose chief attribute is the ability to do as he is told, because such a man most often fails when he is forced to decide something for others. Also, unless the foreman is extremely cautious, he should not pick a man who is anxious to get ahead as fast as possible. Such a person is in an ideal position to knife the foreman and take his job away. Another type of person to avoid will enjoy the job because it means he will be able to get behind a machine and be scarce when there is work to be done.

An alternative method which would be handy in picking the right man would be to have several assistants, one for each type of machine, from whose performance the foreman could decide more easily which would be the best single man for the methods job. In this situation, the men chosen would have to have other work which they could be doing until called on to settle a methods problem; otherwise the system would be too expensive and non-productive to be worthwhile.



TRANSFER OR TAKEOVER

Is it fair to a foreman to take his top-notch assistant to be foreman of another department?

Although it is understandable that the foreman who lost such an assistant would be disappointed, there is no question but that the man should be transferred. It is his reward for excellence, and it's very poor personnel policy not to let a man receive such a reward. The man so refused will sooner or later leave for a better job, because he can, in all likelihood, see that he deserves a promotion which isn't forthcoming. If the foreman can't see it this way, he should try thinking how he would feel under the same circumstances; if he were in line for a promotion to general foreman in another department, for example, he would be seriously disappointed if he were not transferred because his own general foreman didn't want to lose him.

Also, it should be a credit to the foreman to have one of his men so promoted. It shows that he is doing a good job in training and selection of his men. And it is quite possible that, if he were to look around, he might see another candidate for the assistant's job who would turn out well, but who had been overlooked previously because the job was satisfactorily filled.

FINDER'S FEE

Is it a good idea to offer a bonus to employees who get their friends to work in the shop?

Many people say that a shop which keeps good working conditions, where the pay is good, and where treatment is fair, will not have trouble finding more than enough employees to fill its needs. The only trouble with this answer is that many firms do their very best (as far as they know how) and still find good jobs cannot be filled. In these plants, there must be another answer to the recruitment problem.

If the finder's fee is decided upon, there are several precautions which should be noted. First, the fee should be split into two parts—the first part paid upon hiring, the remainder to be paid if the employee is still at the job after a certain period of time, from six months to a year after hiring. This would tend to discourage round-robins of hiring and quitting, where the person hired might split the fee with the finder, and then move onto another job under similar conditions.

It is also a good idea to make it very clear to the finders that their services are only an aid to the personnel department, and that the man under consideration will go through all the normal hiring procedures, and is subject to the final approval of the personnel department.

With all these precautions, the success of the fee-system will depend on the sort of men who suggest new employees. If the man already working is steady, well-intentioned, and the sort of employee you would like to have, the chances of his suggesting suitable additions to the working force will be much better than if he is "just another worker." Some of the men will take advantage of the system to hire enough men to form a clique, and the method might do more harm than good. Because of these shortcomings of the "finder's fee," it might be helpful to keep at hand an evaluation of the person who made the suggestion, when you are interviewing the prospective employee who has been recruited under this system.

ALCOHOLICS FORALLEVUS

How do you solve the problem of the worker who has halitosis?

No answer to this problem seems just right, except that something must be done. A direct approach, simply telling the man what is wrong, and suggesting a remedy, is likely to make an enemy of the person who has to do the telling.

Other methods to correct the situation include running a general notice in the company newspaper (a hint which, the chances are, would not be recognized by the man involved); sending the offender an unsigned form letter from the personnel department; isolation where others won't be offended; installation of chlorophyll gum machines in appropriate places, in the hope that, sooner or later, the offender will take advantage of these facilities.

DOUBLE TROUBLE

Is between-shift friction inevitable, where each shift blames the other for mistakes?

Unless special precautions are taken, this friction seems to be unavoidable, a natural outgrowth of man's urge to hide his mistakes and to appear better than his fellow workers. There are several remedies.

First, it is quite common to put the worst, newest, least-capable men on the night shift. This is backwards, in many respects. There is less supervision at night, and there is much more chance, in the average shop, for a man with poor work habits to disappear for considerable stretches of time, to catch up on sleep, and enjoy other such pleasures.

If the friction exists between the foremen of the various shifts, as often happens, there are several ways to remove the trouble. The commonest answer is to overlap the foremen from 30 min to 2 hr, during which time the foremen could make the shop rounds, talking to the men and finding the truth about various arguments.

Another way might be to rotate the foremen weekly, so that each foreman gets a week with a different shift. Although this would be unpopular with the foremen, it should put an abrupt end to the problem.

Some plants, particularly in certain industries, rotate shifts each week. Unless this is being done, and is a condition of hiring, though, it would be practically impossible to institute it as a new idea with the old personnel. Once the men get into a pattern, it's hard to get them out of it.

WEARING OFF THE GREEN

Is it cheaper or more expensive, in the long run, to spend extra time with new employees on their first day at the job?

Records show that turnover is highest with new men, and any way which can be found to cut this turnover is a saving. There are so many things which are peculiar to each shop that all new men deserve free time their first day on the job to learn these details, for a man who feels at home is less likely to leave for another place to work.

Also, a foreman who spends time with each new man is better able to judge the abilities of this new man, and each person so judged can be placed where he can use his maximum skills. This is another important way to keep men who, if placed in a job beneath their skills, might feel they were wasting time, and might quit.

WHO RATES THE BOSS?

Should men formally rate their supervisors?

Supervisor-rating plans have many pitfalls, but can also be an important source of information otherwise unavailable. The important things to remember are: 1) No worker should be *allowed* to sign his name; this prevents a worker from saying what he knows would be interesting to higher management, even though untrue. 2) Workers under such a program are likely to be skeptical of the purpose of ratings, and therefore, are under no particular compulsion to be truthful. 3) Workers often gripe about conditions which are actually necessary, though undesirable.

In spite of these objections, there is some value in a supervisory-rating, for conditions are often unearthed which demand correction. Even the

foreman can learn of complaints and injustices which had escaped his notice.

It should be kept in mind that the ideal supervisor is not always the most popular supervisor. The ends of management and the workers are somewhat parallel, but not identical. And in the long run, it is more important for the supervisor to meet the needs of higher management than it is desirable to have him suit the wants of his men, if there has to be a conflict between the two groups.

CAN A MAN STEP DOWN?

How do you deal with a recently-promoted assistant who turns out to be unfit for the job?

It is commonly accepted in many shops that "the only successful way out of a job is up." Once a man has been formally promoted, it is unlikely that he can be successfully demoted, because of the changed attitude of those with whom he would be forced to work. The only good possibility is to transfer the man to another department, out of touch with those he has been supervising.

It would have been easier to try a different method of promoting. If an assistant is lacking, it would be more sensible to let the prospect "help out for a few weeks during the rush" until he has been judged under the different circumstances. Then it is much less likely that he will be seriously unsuitable, if he has passed this probationary period.

BLOWOFF

How much direct criticism should a foreman accept from his men?

No supervisor should be above criticism from those who work for him. The question is, how much can be tolerated, and how violent can the criticism be before the complainer has gone too far.

The general opinion of our readers is that a good foreman keeps his men under sufficiently strict control that there won't be hot-tempered outbursts when criticism is being offered. When this has happened, though, something must be done to prevent its recurrence.

If the man who lost his temper is normally a sound and good worker, he should be invited into the foreman's office for a private talk, and it should be explained that such outbursts are out of place and unwelcome. If the man is just a generally poor worker, he should be invited to leave, because his insubordination costs more in morale and discipline than the man contributes to the running of the company.

In any case, the foreman should listen to the complaint, and correct himself, if the complaint seems justified.

CROSS CHECK

If one man has done a job which seemed to take too long, is it fair to give a similar job to another man, to see if the first man's time was too long, particularly if the second man is told about what is happening?

That's a pretty risky way to do business. These are the dangers:

Collusion between the two men. They are sure to talk over the situation, being on the same side of the labor-management picture, and the second man is not likely to want to sabotage his colleague.

Irritation of either or both workers involved. The second man will resent being used as a tool of management, and the first man will dislike the idea that subterfuge is being employed against him.

General unrest in the shop. If it becomes known that such methods are part of management, no one will feel safe from underhanded spying, instead of straightforward treatment.

It is far better to analyze the job from the print, and, if the first man's time is way out of line, call him in for a conference, with the stated goal of simply finding what happened, and seeing if there is something the man isn't too able to do. The aim is to improve his performance for the benefit of all, rather than to try to "pin something on him."

MERIT INVENTORY

Are merit ratings a good way to take a periodic inventory of the quality of production workers?

Frequent merit ratings are a great help in keeping tabs on the quality of your production men. A well-thought-out form makes standards for workers objective, rather than personal, and helps to remind a foreman of a man's good traits or past successes when something has gone wrong with a worker's performance. A balanced picture is maintained.

Periodic reviews force foremen to think about the qualities of their men, and to make an evaluation which might otherwise be put off as an unpleasant chore. There are obvious advantages to having such information on record, such as ease of deciding wage increases, and simplifying the job of a replacement foreman, if the old foreman is transferred or quits to go to another company.

One reader suggested that a form be kept for the machinery, in the same manner as the personnel forms, so that upkeep could be preventive, rather than curative. Many impending troubles might be seen from a declining productivity of a machine. Also, jobs could then be given out to machines on the basis of the machine's ability to produce.

BORROW OR STEAL

Can small shop tools be loaned to the men to take home, for personal use?

If you say "no" to anyone who asks for a loan of small tools, you have simplified your problem, but it is not always the best way to handle the request.

It is likely that in larger shops, where supervision is more remote, that such requests would be refused. However, in small shops, where a more "neighborly" feeling prevails, it is a little more common to decide the problem along somewhat more flexible lines. Generally, if the men are well known to the foreman, it would be acceptable to let the tools be signed out for overnight or weekends, with the understanding that loss or damage would be paid for out of the worker's salary. Anyone who abused this privilege should immediately be denied further access to company tools for home use.

There are several gains to be made from this policy. First, of course, is improved morale and worker attitude. One of the highest goals of any management policy should be to get the men to work as earnestly for the company as they would for themselves, and such things as concern for the men's personal needs are a key to reaching this goal. Also, although it might be rare, there is the off chance that one of the men might own a tool the company needed, and would be much more willing to lend it to the shop, if he could see the shop returning the favor some day.

PIGS IS PIGS

Should a machine operator clean up around his machine?

In the average shop, where machines are primarily hand-operated, it is impractical to have the relatively high-priced operators cleaning the floor around their machines, except for perhaps a small working area. If added sweepers are needed, it is better to hire them.

Some machines—shapers, for example—form such messy chips, and have a sufficiently automatic cycle, that the men who run them can clear enough of the area to avoid walking around in the mess. Many union contracts (and established precedence) prevent operators from doing any work except that for which they were hired, but this situation seems to be a reasonable exception to the rule.

Cleaning machines and small tools presents a different problem. Operators are traditionally responsible for this work, and should be given a specified time each week in which to do it.

ANGLES OR CURVES?

Is it fair to criticize a worker for refusing last-minute overtime, if the man generally accepts such work, but has a special reason for wanting out of it "this once"?

Overtime usually results from one of three situations: an emergency, such as a machine breakdown or a large rush order of a favored customer; seasonal fluctuations or national emergency; and mismanagement.

For hourly workers, the emergency situations can almost always be handled by asking those men capable of doing the needed work which one or ones want the extra time.

Seasonal variations or national emergency work are known far in advance, and arrangements can be made with the work force to have a sufficient number of men on hand. It should be made clear during the employment interviews that this overtime will occur and is a condition of the job, so that those men needed for extra work can plan their personal affairs accordingly.

Mismanagement becomes fairly obvious, after a while, and workers will resent this needless invasion of their personal time. However, when the problem exists, there are almost always men who, anxious for extra work and money, will take the work. Those who don't want the extra work and are often forced to stay longer than they had expected will probably go to work someplace else.

As for salaried workers, there are two categories. Below a certain level of salary, time-and-a-half should be paid for overtime. Above this salary level, the workers involved are usually high in management. These men work to the job, rather than to a time clock, and are being paid for their overall contribution to the company, rather than for the time they spend at a job. If these men have to work very long hours at a job, such as during an extensive reorganization, they should receive some tangible reward for their extra effort. One good way suggested was extra paid vacation.

The fact that there could be any question about whether the man should be forced to take overtime work is an indication of change in favor of the employee, for the problem did not exist a few years ago. If overtime was required, overtime was had, one way or another. There are two principal reasons for this changed attitude. Unions have forced greater consideration for the workers, and the demand for labor is currently such that a company cannot afford to fire good men who refuse short-notice overtime.

DOUBLE STANDARD

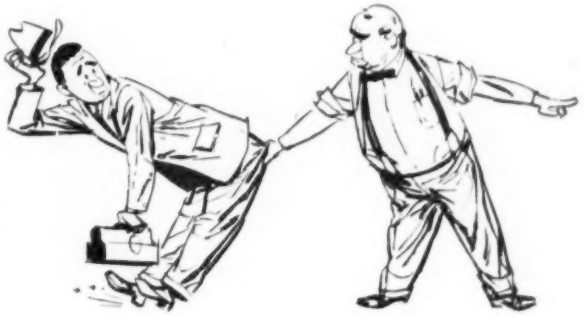
Is it good manufacturing practice to have one set of tolerances in the shop, another for final inspection?

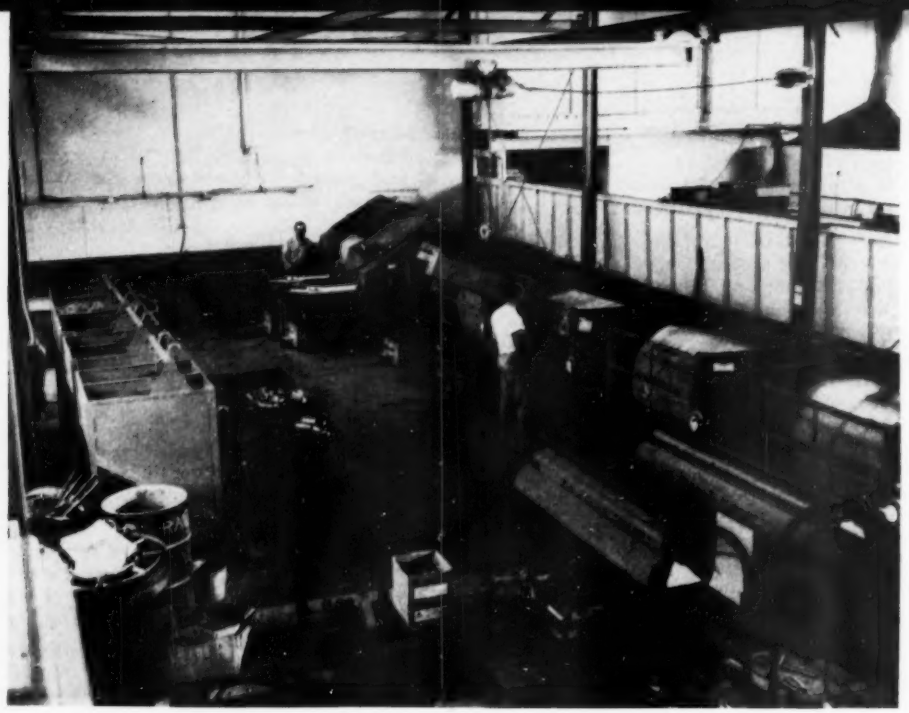
Most of the discussion of this question was about tolerances in general, and how they got that way.

Shop people think a tight tolerance is a nuisance created by inexperienced engineers, making production difficult and costly.

Engineers think shop people are careless and will try to get away with everything they can. Tolerances are sometimes set closer than needed for acceptable parts, in the hope that the shop will be kept on its toes, and that a few more parts will get past final inspection.

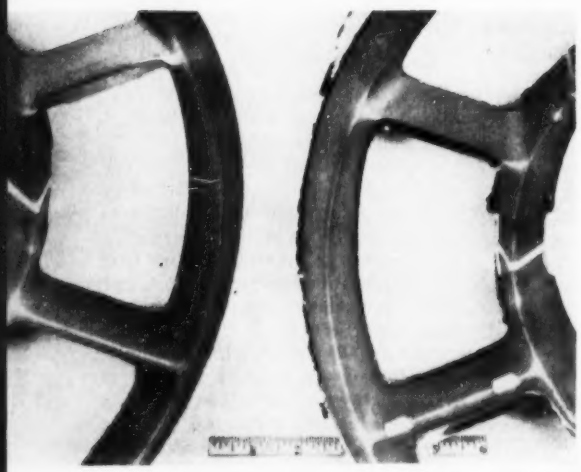
Best answer: First, where possible, designers should spend a year or so on a production floor, learning shop problems; second, difficult tolerances should be established only after discussions between manufacturing, design, and inspection.





EIGHT BINS for tumbling chips (left) and four Roto-Finish tumbling machines (right) make up Ryan's "laundry" department. They are in special room inside machine shop

Ryan's Laundry Saves $100,000 a Year

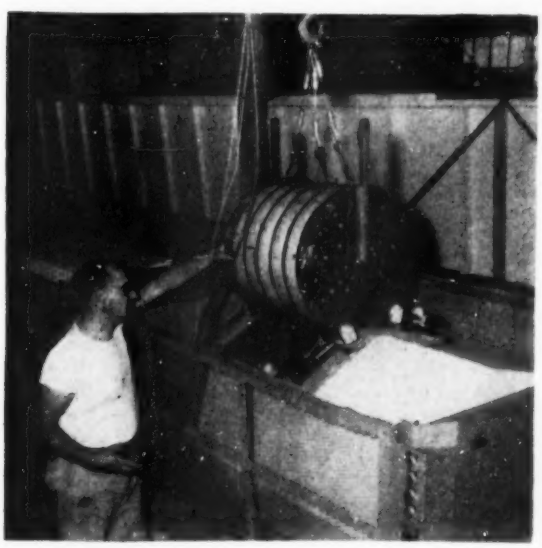


One of the most elaborate finishing setups on the West Coast is Ryan Aeronautical Company's tumbling room, which replaces polishing and buffing wheels, grinders, files, and scrapers. The mechanized finishing system will also save a large amount of elapsed time in batch-finishing aircraft parts

BEFORE AND AFTER EXAMPLES of finish tumbling produces: Top, component for Westinghouse jet-engine afterburner is smoothed and deburred. Center, carburetor-heat pickup tube is Stellite N-155, used in exhaust system for M-48 tank Continental engine. Right, typical stainless-steel part for jet-engine assembly is finished after deburring

GRINDING CHIPS are loaded by overhead hoist and pan into tumbling barrel. Snout on pan fits barrel opening

SMALL PARTS are dumped or loaded by hand into tumbling barrel in loose form. Chips are already in place in right-hand barrel section



LARGE PART which cannot be "free-tumbled" is inserted in fixture and lowered into barrel. Fixture is clamped inside barrel, and part is rotated as chips wear its surface and edges

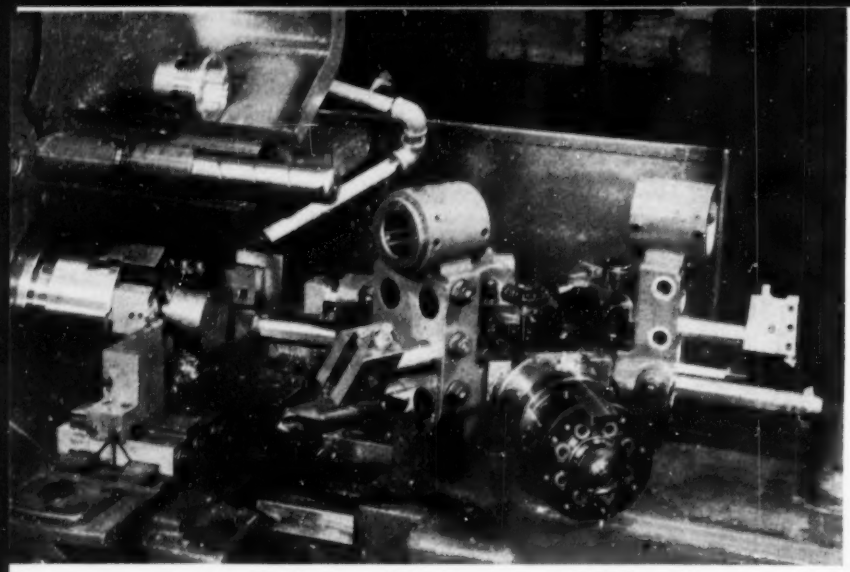
METAL PARTS for jet engines and aircraft components of other kinds are smoothed and cleaned by four Roto-Finish machines installed right in the middle of Ryan's machine shop. They do normal tumbling work, such as deburring and cleaning off stains; and also takes off surface corrosion, fused welding flux, and heat-treat scale, thus replacing sandblasting in some cases.

Two materials are used in the barrels with the parts to be cleaned: chips, which are stones of aluminum-oxide, granite, or limestone, and detergent solutions. Chips come in several sizes, one of which is specified for each particular part. Large chips cut fast, but small ones produce the best surface finish; therefore, a compromise must be made for each part to be handled.

Detergent, too, must be specified for each job. Most of these materials, which reduce surface tension in solution and allow better wetting to clean the parts, are available from the tumbling-machine manufacturer. Ryan has developed one detergent of its own, Raco 210, which is a formulation of acids and wetting agents. It was originally compounded as a cleaner for stainless steel, and is now used in the tumbling machines on stainless parts.

DETERGENT IS POURED OUT of barrel after tumbling cycle. With it goes most of the minute metal particles and dirt removed from the parts

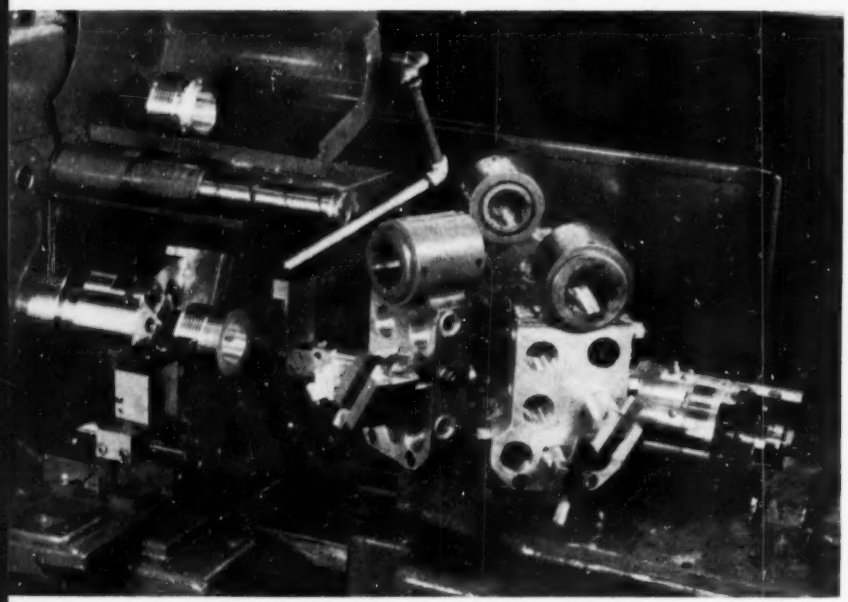
PARTS ARE SEPARATED FROM CHIPS after they have been dumped from machine into pan, and pan is emptied onto screen. Chips are used over until ground down too small to be practical



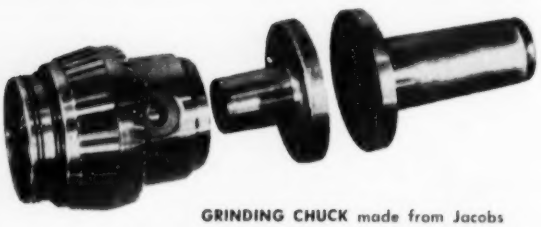
ALUMINUM-ALLOY COMPRESSOR CYLINDER made from barstock on P & J No. 3U automatic. First operation; rough-drill and turn OD; turn groove to form flange; drill 8 holes in flange; semi-finish bore, turn, and face; recess face; semi-finish bore and turn; finish bore recess 3.000 — 3.005 in.; finish bore 2.480 — 2.486; finish OD 3.732 — 3.735; cut fins 0.063 + 0.005 — 0.010 wide to 2.812 — 2.817 root dia

SHOP SHOTS

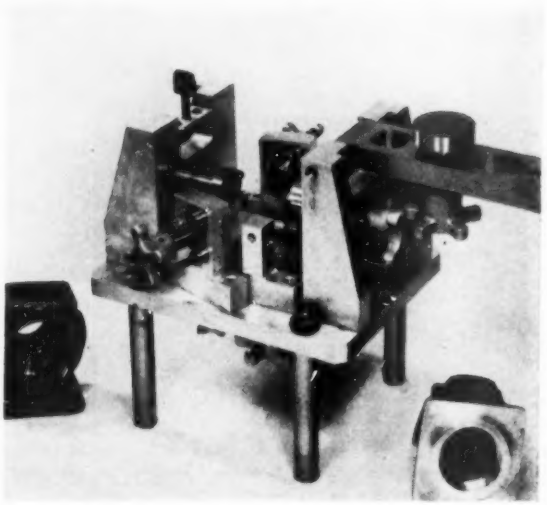
AT WALTER KIDDE & COMPANY



OPERATION NO. 2; pilot work on one flange hole; rough and finish groove to form flange; turn pilot dia and OD; chamfer ID and finish pilot dia; drill 6 holes in flange. Note multiple drillheads used in both operations. Operator breaks corners of all holes in drillpress during machining time and runs both machines. $3^{3}/_{4}$-in. barstock is cut into slugs on automatic cold saw before first operation



GRINDING CHUCK made from Jacobs key-operated spindle-nose chuck, using Rubberflex collets, was designed by Joe Gelcius of grinding dep't. Adapter shank fits grinder spindle, intermediate plate permits slight adjustments to true up chuck when first installed on machine. Unit saves up to 25 min per setup



SCRIBING FIXTURE for compressor crankcase permits rapid layout on all six faces. Hardened steel disks have scribing lip to lay out holes, and flushpin gages are incorporated to check that sufficient stock is available for facing flat surfaces

ROUND TABLE

Foreman or Clerk?

"Did you see that memo that came through this morning, Al? It looks like this company is going to turn into a Washington bureau."

"Yeah, I saw it, Ed. What's wrong?"

"Wrong? There's plenty wrong. If I have to write down every order I make in a day I'll be at the desk all 8 hours and won't ever get anything done. That's what's wrong!"

"Take it easy, Ed. You don't have to write every order down—just any that apply to inter-department operations. I don't see how that will add much work, and it will probably save a lot of argument and trouble later."

"Look, Al. I can trust old Hutchinson to get me stock when I need it; and if he doesn't, I can call him up and raise hell. He doesn't want any red tape, and neither do I. I also think this memo business will actually slow up our operations, because it won't be possible to yell for something I need in an emergency, then fill out a requisition form later."

"One of the main reasons for the memo system, as I understand it, is to make foremen look ahead and avoid emergencies, Ed."

"Oh, nuts! An emergency is an emergency, and you can't rule them out by writing an executive order. They crop up no matter what you do. Look, are you in favor of this system?"

"Sure I am, Ed. I think it will help me keep things organized, and it will sure eliminate fights like I had with Wilson last week. Instead of arguing about who told who what when, we'll have a record of what was asked for. There's no doubt about it in my mind, Ed; we have to get more organization around here. This isn't a one-horse shop any more."

"Yeah, but it's still a one-idea plant, Al. The object is to produce for profit, and if you have to keep men reminded of that fact, you'd be better off without them."

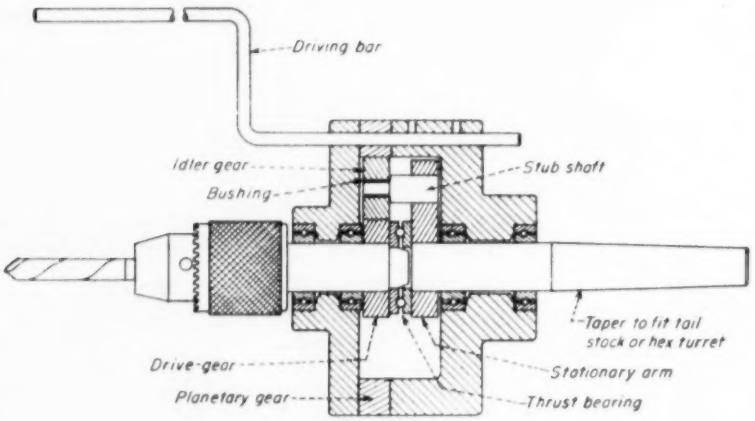
"Oh, I think you can get a lot of work out of people even if they don't always keep main objectives in mind. Besides, how often have you had trouble backing up an argument in an executive meeting because you didn't have record of what was done? How good is your memory, Ed?"

"It's good enough to keep me on top of my department, Al, and that's the important thing."

"Sure, but maybe a few more records will help you do a better job easier."

***How much red tape** can a production department stand? Do foremen spend too much time on paper work now? Have you ever seen a busy shop run completely on verbal orders? Your opinions on this subject may help others in industry. Discussions of earlier topics appear on later pages.*

Practical Ideas



Planetary Gear Attachment Speeds Lathe Drilling

Many times it is necessary to drill a heavy piece in a lathe, and unbalance or size of the work limits the speed at which the piece can be turned. This attachment to fit the tailstock of the lathe will increase the speed of drilling without increasing the speed of rotation.

The device consists of a planetary gear driven from a bar which drives from either the work, or, where this is not feasible, from the chuck. The planetary gear drives an intermediate gear which is attached, through a bushing and a stationary stub shaft, to the tapered bar which fits into the tailstock. (This attachment can also be made to fit the hex turret.)

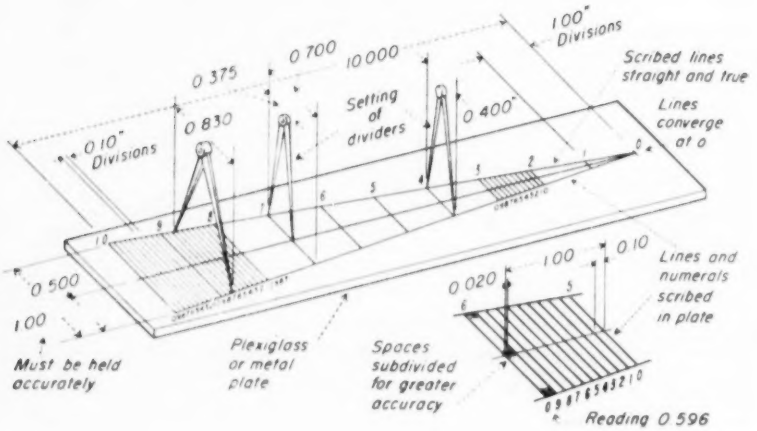
As the intermediate gear rotates, it drives a drive-gear, which is keyed to the shaft on which the drill chuck is mounted. The drill chuck turns in ball or roller bearings, and rotates at a speed greater than that of the work. (The gain in drill speed is the spindle speed multiplied by the ratio of the number of teeth in the planetary gear, to the number of teeth in the driving gear.)

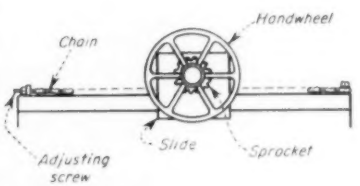
The housing halves are fastened together by bolts which pass through the planetary gear. All parts except the driving bar are made on a lathe, so the device is comparatively easy to put together. *Henry Gifford, Bronx, NY*

Layout Plate Permits Setting Dividers to 0.010-in. Accuracy

With 10:1 Multiplication

J M Heath, Kenmore, N Y

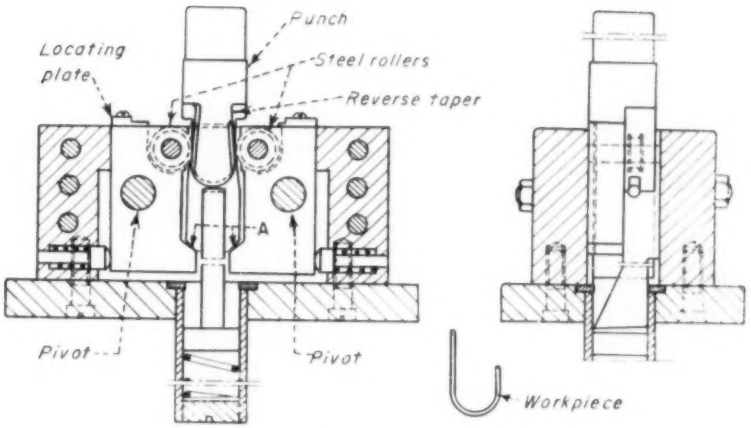




Chain and Sprocket Serve As Simple Toothed Rack

Regular machine-chain can be used as a toothed rack where the rack serves for manual sliding of members, and accuracy is not important.

The chain is anchored to the frame at one end, and provision is made to tension the other end. The simplest arrangement is screw-tensioning. The chain should be supported along its whole length on the side opposite the sprocket. *Haim Murro, Bayonne, NJ*



Combination Punch and Die Allows For Springback in U-shapes

When forming U-shaped details, it is impossible, normally, to make the shape with a single die, because of springback in the workpiece.

This combination die eliminates trouble with such springback. When the punch is up, the workpiece is positioned on top of the die by the locating plates. As the pressram descends, the piece is bent into U-shape by the punch and the steel rollers, which rotate on pins. These rollers are mounted in a steel block.

As the ram descends further the two angled surfaces of the punch strike against surface A, causing the steel blocks to pivot, thus forcing the steel rollers into the work and bending the piece beyond a perfect U-shape. Hence, when springback occurs, the resulting piece will be in the proper shape. The angle to which the reverse taper should be ground on the sides of the punch is determined by the size and kind of material being formed.

The finished piece is ejected by a spring-actuated kickpin. *Hjalmar Dahl, Upplands Vasby, Sweden*

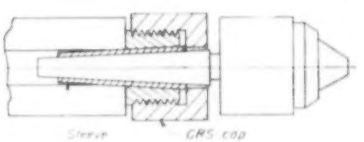
Another Method to Straighten Shear Blades

A recent article in Practical Ideas suggested straightening shear-blades in a drillpress, using the ball out of a ball-bearing.

We have developed a fast and effective way to straighten shear-blades which have warped slightly in hardening.

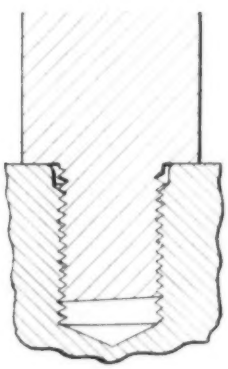
Fit a ball from a ball-bearing into the end of a chipping-hammer chisel, and peen it into position. Then fit the chisel into an air hammer, and peen the shear-blade lightly on the concave side until it is straight.

Straightening with this method removes the need of any further heat-treatment. *P V Dunn, Johannesburg, South Africa*



Adapter Simplifies Taper Removal

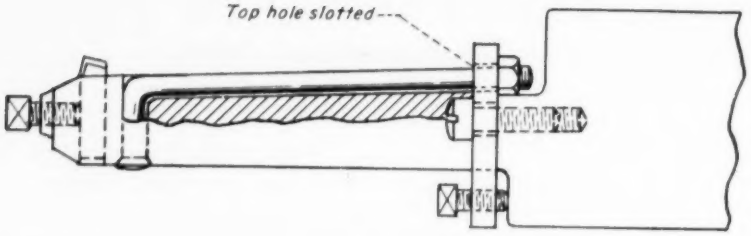
Tailstock taper is often smaller than headstock taper, which means that an adapter sleeve must be used with a drill chuck, to fit the chuck to the headstock. Removal of the tapered sleeve adapter is often difficult, if the sleeve sticks in the chuck when knocked out of the spindle. To avoid this problem, a threaded cap can be made up to fit over the end of the spindle, so that, when the drill chuck is knocked out, the sleeve is held in place. Then the cap can be removed, and the sleeve knocked out without any trouble. *Harold C May, New Britain, Conn*



Eliminate Thread Undercut On Small Shoulder-Screws

Breakage of a small shoulder-screw at the thread undercut was causing trouble, but it seemed difficult to eliminate the undercut until we saw the obvious, simple remedy.

Counterbore the tapped hole to the body size of the screw, just deep enough to miss the imperfect threads. Then the screw can be assembled tight against the shoulder. *J C Magee, Schenectady, NY*



Pre-Stressed Boring Bar Easily Adjustable

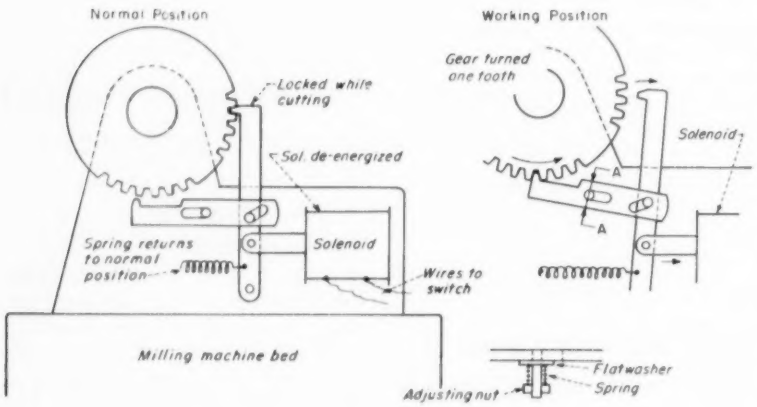
After hearing about "pre-stressed" highway bridges, I decided to try the same thing on boring bars, to try to eliminate bell-mouthed holes which result from flexing of the boring bar. The results are quite satisfactory, and I have an extra bonus in having a bar which is easily adjustable.

The basic idea is to attach a piece of high-tensile steel to the boring bar just behind the cutter, then fasten the other end of the high-tensile steel to the far end of the boring bar. A simple mechanical adjustment strains the boring bar tight, thus "bending" the bar in the direction of boring stress.

To construct the tool, we bore a hole immediately behind, and parallel to, the toolbit hole, and countersink this hole. We then mill a groove from this hole along the bar to the end of the shank which attaches to the turret-holder, and cut away part of the shank where the groove meets it, for a nut which is attached to the steel stress-bar which fits in this grooved channel.

The head of the stress-bar is peened over, to effect a rivet-head, and a thick washer with 4 equally spaced holes is put on the bar, with ample clearance. One hole in the washer is tapped for a setscrew which acts as a strainer. Two other screws are put through the washer and threaded into the boring-bar shank parallel to its axis. The end of the stress-bar is threaded and a nut is put on it behind the washer. Tightening the two screws on the sides of the washer puts a strain on the boring bar. Finally, by tightening the setscrew, the washer rocks and stresses the whole arrangement, and deflects the bar accordingly.

The extra bonus for this design is that by tightening the nut on the base of the boring bar, I can make small allowances for tool wear. This is much easier than loosening the boring tool and slipping it in a few thousandths to allow for wear. *N Palmer, Paddington, NSW, Australia*



Solenoid-Actuated Index-Head

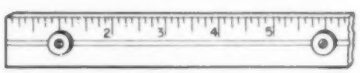
This solenoid-actuated index-head is easily made and attached to a milling machine, planer, shaper, or any other machine which has a reciprocating motion.

The index-head was made originally for a milling machine, where a trip-switch at the end of the return-stroke energized the solenoid, thus indexing the work a distance of one gear-tooth.

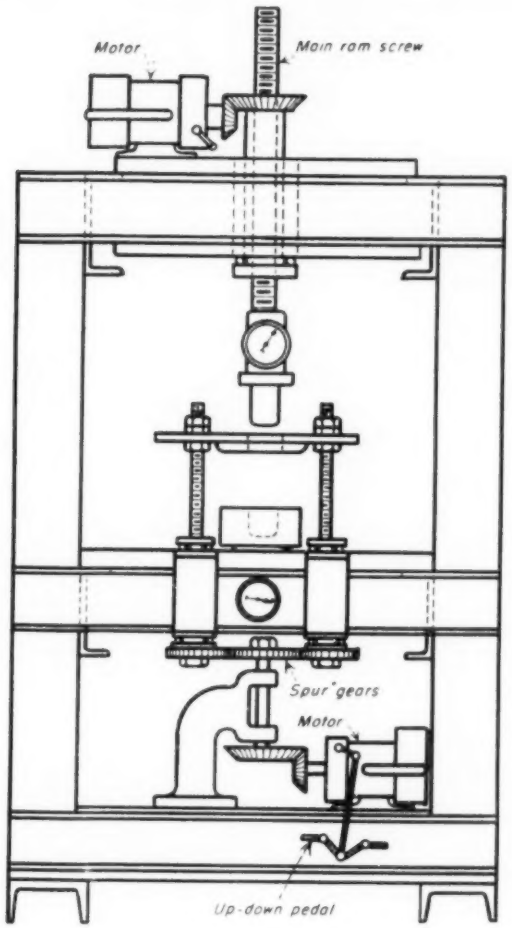
A spring keeps the mechanism locked in place while cutting is taking place. The adjustable, spring-loaded nut keeps the lower lever in position until the upper lever is pulled back by the solenoid, whereupon the lower lever is pushed into engagement with the indexing gear, and moves the gear one tooth-space to the right. *Ballard E Long, Jr, Knoxville, Tenn*

Scale Makes Sine-Bar

A 12-in. scale can be converted into a precision sine-bar by adding two toolmakers' buttons at its centerline. Drill and tap two small holes at the center of the scale, and insert two toolmakers' buttons,



finger tight. Then shift the buttons until they measure 5 in., center to center, and tighten them. *William Adams, Bayside, LI, NY*



Simple Double-Acting Screw Press For Experimental Work

Successful deep-drawing and double-acting forming have been done on this simple, double-acting screw press, which can be easily made for experimental and small-run production purposes.

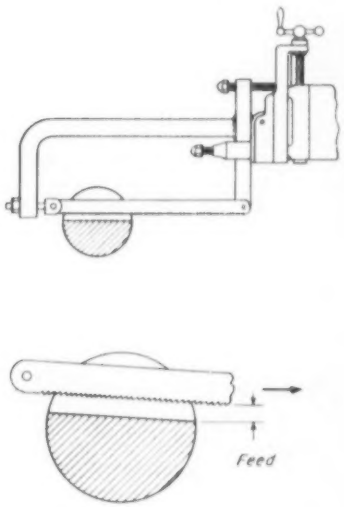
The frame of the press is heavy structural steel channels bolted together. Two 1½ hp motors, which were removed from two salvaged drillpresses, supply power to drive the main and auxiliary screw rams. These motors have variable rpm, and can be rotated in either direction. Each motor has two handles, to control speed and direction. One of these motors is installed on top of the press, and drives the ram unit of the main ram screw. Thrust ball-bearings take the thrust on the ram nut. The punch is set on the main screw ram to form the sheet on the die. A hydraulic ram gage indicates the pressure of forming.

The other motor, mounted on the bottom of the press, drives a set of gears which rotate four small ram nuts, moving a holding plate up or down, depending on the direction of rotation of the motor.

This steel holding plate is mounted on the tops of the four screw rams, and, when downward pressure is applied to the plate, puts holding pressure on the sheet. This plate is changed for different dies.

The press bed is made of heavy steel plate reinforced for support. Another hydraulic ram gage is mounted on the end of the cylinder, so that holding pressure and the total load applied on the die will be indicated on this gage.

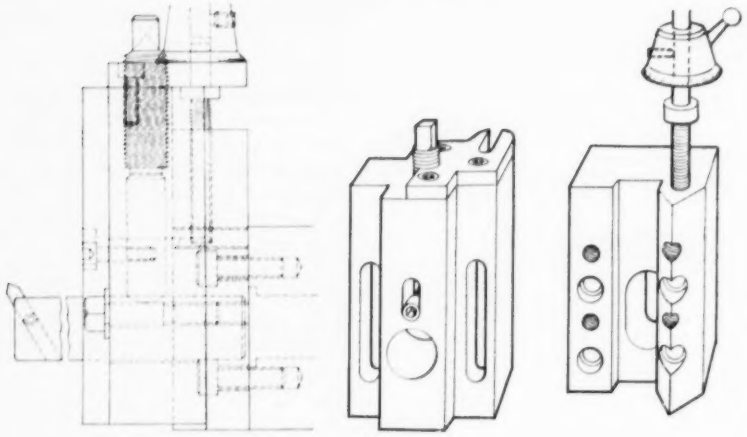
The indicated readings of the gages help a great deal in experimental work in die design. *T H Hsu, Taichung, Taiwan*



Shaper Fills In As Emergency Hacksaw

In emergency cases, or for special jobs, a shaper can be converted to a hacksaw by clamping a specially adapted hacksaw bow in the toolpost of the shaper. The side of the bow clamped to the toolpost has an oblong cross-section that will fit in place of the tool. It also carries a bolt to lock the clapper, preventing the saw from jerking.

The clapper is shimmed and adjusted so the saw blade will be at a slight angle to horizontal. This will disengage the blade teeth from the work at the end of the return stroke, and, when the saw is fed into the work in this position, will insure an equal cut all along the blade. Feed is manual by lowering the tool-slide before each stroke. *Haim Murrow, Bayonne, NJ*



Aluminum Slide for Turret Boring

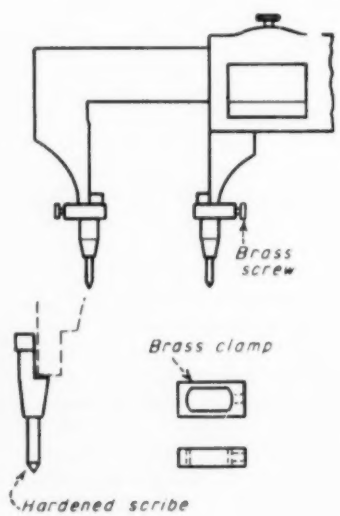
Fitting a solid boring-bar to a ram-turret often presents a problem. The hexagon turret casting has tapped holes suitable for entering from only the front, so that pockets have to be provided in the tool bodies, for screwheads. This makes the tool longer than is desirable, adding weight and reducing rigidity.

We make our own vertical boring heads with a slide similar to V-slide lathe ways. This small machine-steel section is bolted to the turret with the customary 4 socket-head screws. To this section we bolt a forged aluminum-alloy rectangular plate, using two heavy screws which pass into the flat and the V-way. The aluminum piece is slotted, and is reclamped every time the tool is moved, thus making one solid mass, with considerably shorter overhang than the usual tool. Also, we find that aluminum forgings are both tough and durable, and have a "deadness" in thick sections, which absorbs vibration better than thin pieces of machine steel, which "ring" when vibrated. *N Palmer, Paddington, Australia*

Attachment to Verniers Aids Checking Scribe Marks

These clips, made to fit any standard vernier calipers, are very handy in checking scribe marks. The clips must be very carefully made, but, once complete, do a job which is otherwise hard to accomplish. When properly constructed, the calipers give a direct reading, and scribe marks can be made or checked to relatively high accuracy.

It will be noted that the inside of each clip is contoured to fit the radius of the caliper nose. The scribes are made of hardened steel; the clamps, of brass, tapped for a brass screw. *W I Morgan, Somerset, England*



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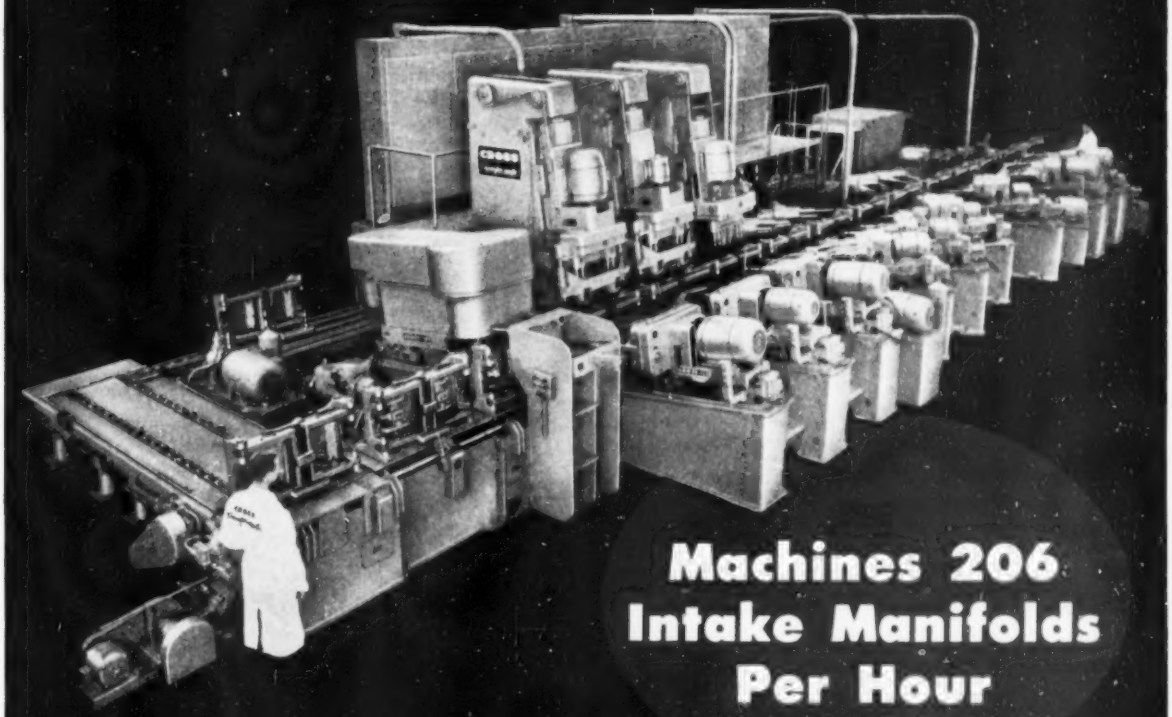

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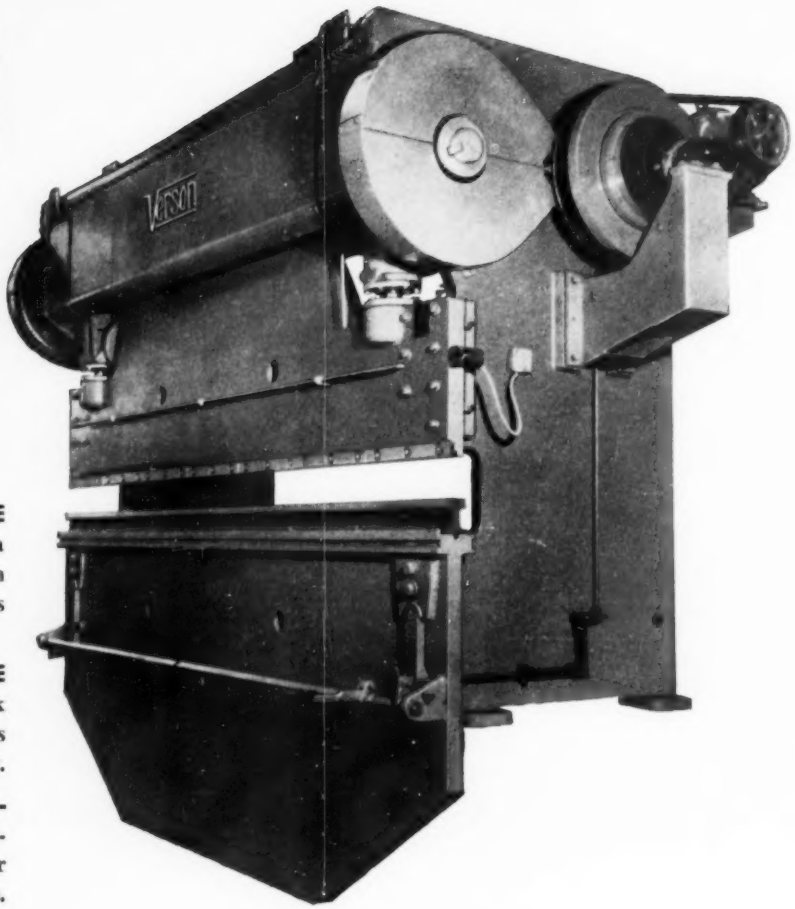

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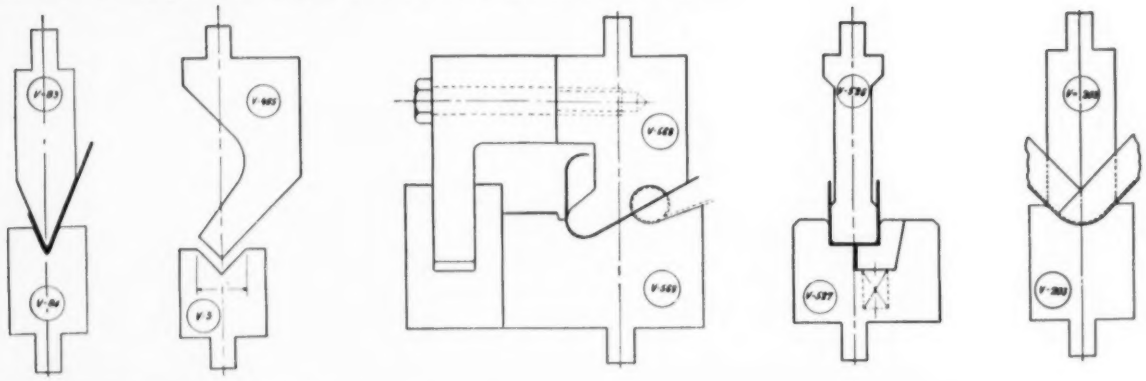

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Lap Materials

Lap material influences the speed and accuracy of lapping, and the quality of finish produced. The harder the lap, the slower the cutting action and the greater the geometric accuracy, but the finish is duller and the lap wears more rapidly.

Porosity of the lap material is of lesser importance than hardness. Open-grained cast iron provides a faster cut than dense cast iron or steel, at some sacrifice of luster. Where practical, the lap should be made of softer material than the workpiece.

Lapping speeds

Variations in speed, as indicated by rate of lap rotation or traverse of the work if the lap remains stationary, will not appreciably affect the rate of cut or the finish, if within 200 to 800 fpm.

Cleaning of Lapped Work

Lapping compounds are supplied in types that are water soluble, and soluble in organic compounds. For hand cleaning of parts finished with water-soluble compound, use hot or cold water and a brush. For machine cleaning, add soap or detergents to the water. Kerosene may be employed to remove the organic-soluble compounds.

Lapping Procedures

Seal Faces

Production of a gas-tight seal between the end of a shaft and a "sylphon" seal is an exacting operation. For the shaft, the cast-iron lap is shaped like a Type 1 grinding wheel with true sides and with an OD larger than the OD of the bearing. The wheel ID has clearance over the shaft projection. With the shaft revolving at 150 rpm in a speed lathe, the lap is gently brought into contact with the bearing surface. A square of 11/0 pouncing paper moistened with suitable finishing compound is inserted between the lap and the bearing.

The soft sealing member is moved by hand in a figure-eight pattern over a cast-iron lapping plate, but not until a high luster is obtained. A matte surface more quickly seats itself to the companion part.

After both parts are lapped individually, revolve the shaft at 100 rpm, moisten the seal area with lapping compound and hold the sylphon in contact with the shaft until seated. Clean the parts and keep them in matched pairs.

Cylinders and Pistons

For cylinders ¼-in.-dia and larger, replace the abrasive sticks in a honing head with whitewood sticks and moisten with lapping compound. If a faster cut is required use cast-iron sticks.

For smaller cylinders, use a whitewood lap turned approximately to size, split it lengthwise with the grain, and insert abrasive paper or cloth in the slit to obtain a fairly tight fit in the bore. Width of abrasive material should be about one-half the length of the bore. Revolve the lap at 100 to 300 rpm, hold the cylinder by hand and oscillate on the lap. Use compound.

For air cylinders with packed plungers, an expanding lap with leather facing, and operated at 700 rpm usually produces the desired smoothness.

Packless plungers in all metals can be finished with a cast-iron split lap held by hand on the revolving workpiece.

Machine Spindles

By lapping, the regrinding of spindles running in bronze and babbitt bearings is often unnecessary, because the operation corrects minor out-of-roundness and removes ridges. The work can often be done at the machine location, and produces maximum contact area on spindle and bearing surfaces for long life without run in.

Some end movement or oscillation is essential during lapping to avoid grooving. After preliminary alignment, the spindle is turned by hand or with a light belt. Compound may be applied through the oil-hole or to the parts before assembly. Bearings are adjusted to a slight drag or resistance to hand rotation. After rotation with oscillation for several minutes with one grade of soft compound, add more compound and machine oil. When the surfaces are dark gray, clean thoroughly, appiy a fine-grit soft compound and lap until the surfaces are a light gray. Now continue rotation and oscillation while adding machine oil in increasing quantities until all compound has been eliminated. Make final adjustment of bearing to a slight drag and run for 5 to 10 min. with oil only. Clean thoroughly and re-assemble.

Rolls

For rolls up to 8-in.-dia, cast a lead lap around the part, using a tapered cast-iron mold. Split the lap lengthwise in one place, use the mold as a compressor by driving it up on the taper of the lap. For rolls over 8-in. dia, mold a block about 6 in. long, bore 0.003 in. larger than the work OD, split with ½-in. gap. Hold the two halves on the work with an adjustable steel clamp fastened to a lathe carriage, and rotate the work while feeding the carriage back and forth.

Cylindrical work can be lapped in a cylindrical grinder, using a carefully balanced lead wheel. The wheel should not run faster than 2000 fpm, its thickness should be one-half that of the regular wheel, and its face and sides must be very carefully trued. Traverse rate should be the miniumum available on machine.

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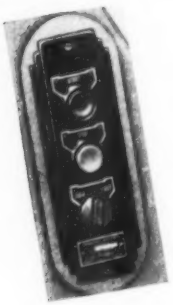

● Here is a machine designed to perform light drilling and tapping operations at high speed with minimum of effort. Any one of six spindle speeds may be quickly selected and tapping is always instantly available without any adjustments to the machine. It makes an excellent choice for miscellaneous work on a large layout of varying size holes.

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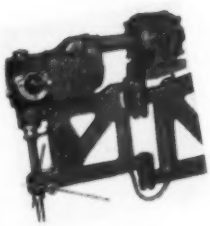

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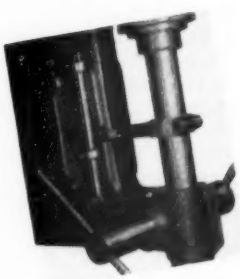

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MACHINE TOOLS

American Machinist REFERENCE BOOK SHEET

Taper-Lock Chain Sprockets...I

By R. J. HOWISON, Vice President, MORSE CHAIN CO.

Type B taper-lock chain sprockets now standardized and stocked by the roller-chain industry avoid the time and expense of reboring and keying plain-bore sprockets. The latter are usually stocked in nominal bore sizes. With the taper-lock design, however, distributors stock a variety of bushings that will fit a variety of shaft sizes as well as sprockets in various pitches and tooth numbers. For example, the No. 1610 bushing, having bore sizes ½ to 1⅝ in. dia in increments of 1/16 in., will fit 29 sizes of Nos. 40, 50, and 60 Type B sprockets.

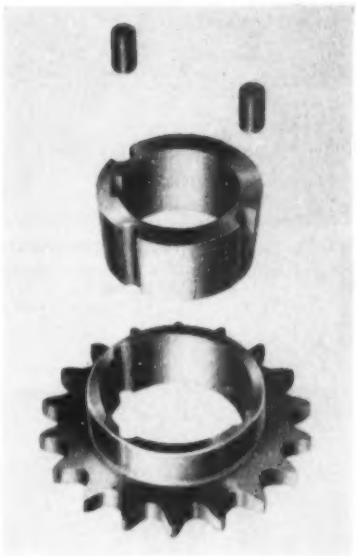
The assembly consists of a taper-bored steel sprocket; a split cast-iron bushing with a tapered OD and a keyed straight bore; plus two cone-point headless setscrews. The bushing has one threaded, full-depth half-hole and two plain, half-depth, cone-bottom half-holes. The sprocket has two similar full-depth threaded half-holes that match with the plain holes in the bushing OD and a plain half-depth half-hole that mates with the threaded half-hole in the bushing.

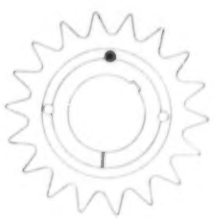
Tightening the two screws in the threaded half-holes in the sprocket causes the bushing to close in and grip the OD of the shaft on which it is mounted. Removing both screws and inserting one in the threaded half-hole in the bushing and tightening it causes the bushing to release its grip on the shaft and back out of the sprocket.

Taper-lock sprockets are compact. In some cases they have shorter hub lengths than conventional standard Type B plain sprockets. For example, No. 50 Type B plain-bore sprockets having 11, 12, 13 and 14 teeth have 1-in. hub lengths compared with a ⅞-in. hub length for taper-lock sprockets.

Another advantage of the taper-lock sprocket design is its ability to grip a shaft with the firmness of a press fit. In addition to promoting sprocket wear life, this feature has an additional advantage of allowing from 0.005 to 0.006-in. variation in shaft OD and still retain the tight grip. Thus, the measuring, turning, and grinding of shafts that is often associated with the installation of rebored plain sprockets is avoided.

In general, taper-lock sprockets delivered off-the-shelf cost less than plain sprockets that have to be bored and keywayed.





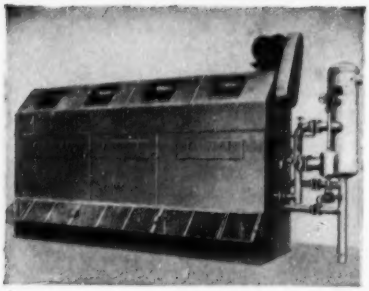
INSTALLATION ON SHAFT

To install a taper-lock sprocket on a shaft, the outside of the bushing and the sprocket bore are first wiped clean and the thread and the point of the setscrews lubricated. Then the screws are placed loosely in the holes indicated 'o' in the accompanying sketch. With the bushing still free in the hub, the sprocket is slipped on the shaft and positioned as desired. Then the screws are alternately tightened, causing the bushing to grip the shaft.

To remove a taper-lock sprocket from a shaft, both setscrews are removed. Then one of the setscrews is inserted in the hole marked with black 'o' in the sketch and tightened until the bushing loosens in the hub and release its grip on the shaft.

TABLES

The accompanying tables list dimensions and bushing numbers for standard ½, ⅝, ¾, 1, and 1¼-in. pitch Type B taper-lock sprockets in a variety of tooth numbers. A separate table lists dimensions of taper-lock bushings that fit the various sprockets.



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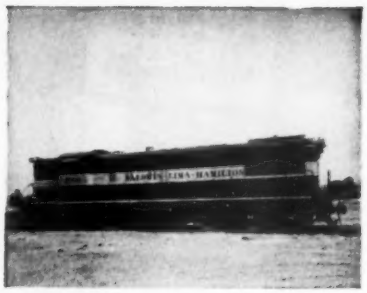

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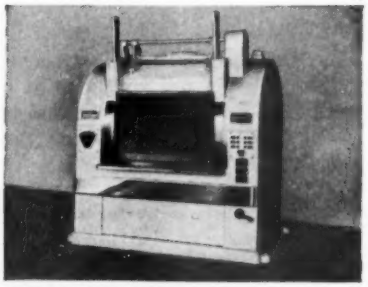

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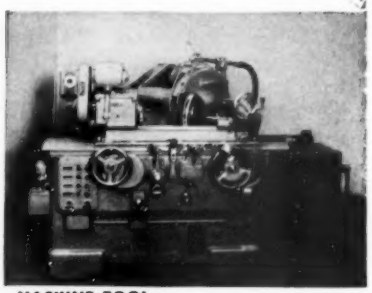

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Taper-Lock Chain Sprockets...II

DIMENSIONS OF TYPE B TAPER-LOCK STOCK SPROCKETS

NO. 40 SPROCKETS

No. of Teeth	Bushing No.	Max. Stock Bore	Bore Lgth.	Hub Dia	Outside Dia
14	1008	1	⅞	1 13/16	2.491
15	1008	1	⅞	1 13/16	2.652
16	1008	1	⅞	1 13/16	2.814
17	1210	1 ¼	1	2 3/16	2.975
18	1210	1 ¼	1	2 15/32	3.135
19	1210	1 ¼	1	2 15/32	3.296
20	1610	1 ⅜	1	2 23/32	3.457
21	1610	1 ⅜	1	2 23/32	3.617
22	1610	1 ⅜	1	2 23/32	3.778
23	1610	1 ⅜	1	3	3.938
24	1610	1 ⅜	1	3 1/4	4.098
25	1610	1 ⅜	1	3 1/4	4.258
26	1610	1 ⅜	1	3 1/4	4.418
28	1610	1 ⅜	1	3	4.738
30	1610	1 ⅜	1	3	5.057
32	1610	1 ⅜	1	3	5.377
35	1610	1 ⅜	1	3	5.855
36	1610	1 ⅜	1	3	6.015
40	1610	1 ⅜	1	3	6.653
42	1610	1 ⅜	1	3	6.972
45	1610	1 ⅜	1	3	7.451
48	1610	1 ⅜	1	3	7.928
54	1610	1 ⅜	1	3	8.885
60	1610	1 ⅜	1	3	9.841
70	2012	2	1 ¼	3 5/16	11.434
72	2012	2	1 ¼	3 5/16	11.752
80	2012	2	1 ¼	3 5/16	13.026
84	2012	2	1 ¼	3 5/16	13.663
96	2012	2	1 ¼	3 5/16	15.573
112	2517	2 ½	1 ¾	4 ¼	18.122

NO. 50 SPROCKETS

No. of Teeth	Bushing No.	Max. Stock Bore	Bore Lgth.	Hub Dia	Outside Dia
12	1008	1	⅞	1 13/16	2.708
13	1008	1	⅞	1 13/16	2.911
14	1008	1	⅞	1 13/16	3.113
15	1210	1 ¼	1	2 15/32	3.315
16	1610	1 ⅜	1	2 23/32	3.517
17	1610	1 ⅜	1	2 23/32	3.719
18	1610	1 ⅜	1	2 23/32	3.920
19	1610	1 ⅜	1	3	4.120
20	1610	1 ⅜	1	3 1/4	4.321
21	1610	1 ⅜	1	3	4.522
22	1610	1 ⅜	1	3	4.722
23	2012	2	1 ¼	3 5/16	4.922
24	2012	2	1 ¼	3 5/16	5.122
25	2012	2	1 ¼	3 5/16	5.322
26	2012	2	1 ¼	3 5/16	5.522
28	2012	2	1 ¼	3 5/16	5.922
30	2012	2	1 ¼	3 5/16	6.321
32	2012	2	1 ¼	3 5/16	6.721
35	2012	2	1 ¼	3 5/16	7.319
36	2012	2	1 ¼	3 5/16	7.519
40	2012	2	1 ¼	3 5/16	8.316
42	2012	2	1 ¼	3 5/16	8.715
45	2012	2	1 ¼	3 5/16	9.313
48	2012	2	1 ¼	3 5/16	9.911
54	2012	2	1 ¼	3 5/16	11.106
60	2012	2	1 ¼	3 5/16	12.301
70	2517	2 ½	1 ¾	4 ¼	14.292
72	2517	2 ½	1 ¾	4 ¼	14.690
80	2517	2 ½	1 ¾	4 ¼	16.282
84	2517	2 ½	1 ¾	4 ¼	17.079
96	2517	2 ½	1 ¾	4 ¼	19.466
112	2517	2 ½	1 ¾	4 ¼	22.651

NO. 60 SPROCKETS

No. of Teeth	Bushing No.	Max. Stock Bore	Bore Lgth.	Hub Dia	Outside Dia
11	1008	1	⅞	1 13/16	3.004
12	1008	1	⅞	1 13/16	3.249
13	1210	1 ¼	1	2 15/32	3.493
14	1210	1 ¼	1	2 15/32	3.736
15	1610	1 ⅜	1	2 23/32	3.979
16	1610	1 ⅜	1	3	4.221
17	1610	1 ⅜	1	3 1/4	4.462
18	1610	1 ⅜	1 ⅛	3	4.704
19	1610	1 ⅜	1 ⅛	3	4.945
20	2012	2	1 ¼	3 5/16	5.185
21	2012	2	1 ¼	3 5/16	5.426
22	2012	2	1 ¼	3 5/16	5.666
23	2012	2	1 ¼	3 5/16	5.907
24	2012	2	1 ¼	3 5/16	6.147
25	2012	2	1 ¼	3 5/16	6.387
26	2012	2	1 ¼	3 5/16	6.627
28	2012	2	1 ¼	3 5/16	7.107
30	2012	2	1 ¼	3 5/16	7.586
32	2012	2	1 ¼	3 5/16	8.065
35	2012	2	1 ¼	3 5/16	8.783
36	2012	2	1 ¼	3 5/16	9.022
40	2012	2	1 ¼	3 5/16	9.980
42	2012	2	1 ¼	3 5/16	10.458
45	2012	2	1 ¼	3 5/16	11.176
48	2012	2	1 ¼	3 5/16	11.893
54	2517	2 ½	1 ¾	4 ¼	13.327
60	2517	2 ½	1 ¾	4 ¼	14.761
70	2517	2 ½	1 ¾	4 ¼	17.150
72	2517	2 ½	1 ¾	4 ¼	17.628
80	2517	2 ½	1 ¾	4 ¼	19.539
84	2517	2 ½	1 ¾	4 ¼	20.494

NO. 80 SPROCKETS

No. of Teeth	Bushing No.	Max. Stock Bore	Bore Lgth.	Hub Dia	Outside Dia
10	1215	1 ¼	1 ½	2 3/16	3.678
11	1215	1 ¼	1 ½	2 15/32	4.006
12	1615	1 ⅜	1 ½	3	4.332
13	1615	1 ⅜	1 ½	3	4.657
14	1615	1 ⅜	1 ½	3	4.982
15	1615	1 ⅜	1 ½	3	5.305
16	2012	2	1 ¼	3 5/16	5.627
17	2012	2	1 ¼	3 5/16	5.950
18	2012	2	1 ¼	3 5/16	6.271
19	2012	2	1 ¼	3 5/16	6.593
20	2517	2 ½	1 ¾	4 ¼	6.914
21	2517	2 ½	1 ¾	4 ¼	7.235
22	2517	2 ½	1 ¾	4 ¼	7.555
23	2517	2 ½	1 ¾	4 ¼	7.875
24	2517	2 ½	1 ¾	4 ¼	8.196
25	2517	2 ½	1 ¾	4 ¼	8.516
26	2517	2 ½	1 ¾	4 ¼	8.836
30	2517	2 ½	1 ¾	4 ¼	10.114
32	2517	2 ½	1 ¾	4 ¼	10.753
36	2517	2 ½	1 ¾	4 ¼	12.030
40	2517	2 ½	1 ¾	4 ¼	13.306
45	2517	2 ½	1 ¾	4 ¼	14.901
48	2517	2 ½	1 ¾	4 ¼	15.857
54	2517	2 ½	1 ¾	4 ¼	17.769
60	2517	2 ½	1 ¾	4 ¼	19.681
70	3020	3	2	5 ¼	22.867
80	3020	3	2	5 ¼	26.052

NO. 100 SPROCKETS

No. of Teeth	Bushing No.	Max. Stock Bore	Bore Lgth.	Hub Dia	Outside Dia
11	1615	1 ⅜	1 ½	3	5.007
12	1615	1 ⅜	1 ½	3	5.415
13	2012	2	1 ⅜	3 5/16	5.821
14	2012	2	1 ⅜	3 5/16	6.227
15	2517	2 ½	1 ¾	4 ¼	6.631
16	2517	2 ½	1 ¾	4 ¼	7.034
17	2517	2 ½	1 ¾	4 ¼	7.437
18	2517	2 ½	1 ¾	4 ¼	7.839
19	2517	2 ½	1 ¾	4 ¼	8.241
20	2517	2 ½	1 ¾	4 ¼	8.642
21	2517	2 ½	1 ¾	4 ¼	9.043
22	2517	2 ½	1 ¾	4 ¼	9.444
24	2517	2 ½	1 ¾	4 ¼	10.245
26	2517	2 ½	1 ¾	4 ¼	11.045
30	3020	3	2	5 ¼	12.643
32	3020	3	2	5 ¼	13.442
36	3020	3	2	5 ¼	15.038
40	3020	3	2	5 ¼	16.633
45	3020	3	2	5 ¼	18.626
48	3020	3	2	5 ¼	19.821
54	3020	3	2	5 ¼	22.212
60	3020	3	2	5 ¼	24.601

TAPER-LOCK BUSHINGS

Bore diameters available in ⅛ in. increments between minimum and maximum as shown below.

Bore	Keyseat	Screw
Bushing No. 1008		
½, ⅝	⅛ X ⅛	¼ X ½
⅝ — ⅞	3/16 X 3/32	
15/16 — 1	¼ X ⅛	
Bushing No. 1210		
½, ⅝	⅛ X ⅛	
⅝ — ⅞	3/16 X 3/32	⅜ X ¾
15/16 — 1 ¼	¼ X ⅛	
Bushing No. 1215		
½, ⅝	⅛ X ⅛	
⅝ — ⅞	3/16 X 3/32	⅜ X ¾
15/16 — 1 ¼	¼ X ⅛	
Bushing No. 1610		
½, ⅝	⅛ X ⅛	
⅝ — ⅞	3/16 X 3/32	
15/16 — 1 ¼	¼ X ⅛	⅜ X ¾
1 5/16 — 1 ½	⅜ X 1/16	
1 5/16 — 1 ⅜	⅜ X ⅛	
Bushing No. 1615		
½, ⅝	⅛ X ⅛	
⅝ — ⅞	3/16 X 3/32	
15/16 — 1 ¼	¼ X ⅛	⅜ X ¾

Bore	Keyseat	Screw
1 5/16 — 1 ½	⅜ X 3/16	
1 5/16 — 1 ⅜	⅜ X ⅛	
Bushing No. 2012		
½, ⅝	⅛ X ⅛	
⅝ — ⅞	3/16 X 3/32	
15/16 — 1 ¼	¼ X ⅛	⅞ X ⅞
1 5/16 — 1 ⅜	⅜ X 3/16	
1 5/16 — 1 ⅞	½ X ¼	
1 5/16 — 2	½ X 3/16	
Bushing No. 2517		
½, ⅝	⅛ X ⅛	
⅝ — ⅞	3/16 X 3/32	
15/16 — 1 ¼	¼ X ⅛	
1 5/16 — 1 ⅜	⅜ X 3/16	½ X 1
1 5/16 — 2 ¼	½ X ¼	
2 1/16 — 2 ½	⅝ X 3/16	
Bushing No. 3020		
15/16 — 1 ¼	¼ X ⅛	
1 5/16 — 1 ⅜	⅜ X 3/16	
1 5/16 — 2 ¼	½ X ¼	⅝ X 1 ¼
2 1/16 — 2 ¾	⅝ X 3/16	
2 1/16 — 3	¾ X ¼	

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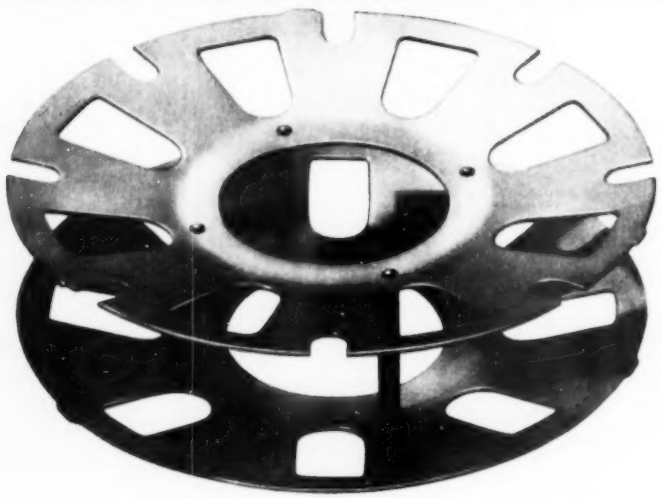

Cast pilot rings (at top) for an oil-fired circulating heater warped and disintegrated—sometimes after only a few months' service. The rings wouldn't stand up at cherry-red heat, and replacements were expensive.

To increase service life of the pilot ring and reduce costly maintenance, the manufacturer replaced the castings with the stamped assembly shown below. This unit is made of 16-gage Armco 17, Type 430, stainless steel strip and ¼-inch diameter Armco 17 spacer rods. The new parts weigh about one-third as much as the castings.

Hundreds of stainless steel applications in high temperature jobs show that the manufacturer can expect to save far more in replacement expense than the additional cost of the stainless steel. Moreover, he will have a new quality sales point.

STAINLESS STEELS TO SUIT CONDITIONS

Armco 17 does well in most fiery jobs—withstands temperatures up to 1550 degrees F without destructive scaling. Yet there are numerous other stainless grades for more severe service than in this oil burner. Certain grades will resist temperatures up to 2000 degrees F. Others have especially high tensile and creep strengths at elevated temperatures. For information on how to select a stainless steel for high temperature service write for the booklet, "Armco Stainless Steels for Heat Resistance."

ARMCO STEEL CORPORATION

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TALKING SHOP

Color Change

THREE COLORS of hangers are used on a closed-circuit conveyor serving two groups of machines at the Edwards Plant of Saco-Lowell Shops. Unmachined parts are hung on red. Parts are transferred to yellow after the first operation and to black (for removal) after the second. Considerable time is saved over previous nondescript hanging and resulting confusion.

A single sentence in this company's annual report points out that operations in the North Carolina plant were more efficient than those in Maine. A company official, when questioned, said that equipment and wage rates were the same, but workers in the South are much more productive. We have previously reported a case in which the same machine, a hone, was ten or more times as productive in the South as in the North during World War II. Such shortsightedness on the part of Northern labor may revise Horace Greeley's famous statement to: "Go South, young manufacturer, go South!"

Bore Grind

WHITIN MACHINE WORKS, Whitinsville, Mass., makes a twister for synthetic textile yarns that involves some close gear tolerances. One train of 16 gears has maximum backlash of only 0.025 in., and one 7-in.-dia gear has only 0.0015-in. concentricity tolerance. Two HSS gears for a draw roll are cut, then hardened and lapped, with less than 0.0005 in. runout. Principal factors in obtaining such tolerances are said to be selection of low-distortion-factor steel, and grinding the *bore* of finished hardened gears to attain concentricity within 0.00015 in.

Peening Wherefores

THERE IS a minimum shot velocity for each shot size, and a minimum exposure time, to obtain best fatigue life, considerably lower than that normally used. Pressures and times above these waste air and do not add to durability, say R L Mattson and W S Coleman, Jr, of GM Research. They've just tested 400 leaf springs. Shot peening increased fatigue life 20 times over non-peened specimens, and shot peening while the specimen is under tensile strain increased it to 200 times (or 10 times strain-free peening). Strain should be greater than 80% of yield strength. Shot size is not very important, and peening introduces residual compressive stresses of the order of 50% of yield strength, depth of compressed layer increasing with shot size and velocity from 0.006 to 0.026 in. Shot peening with the piece under tensile strain introduces residual stresses much greater than 50%, and there is a direct relationship between stress magnitude and fatigue life.

Grapevine

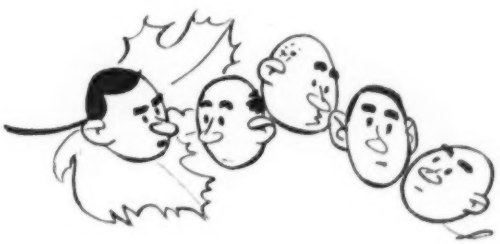
CARBOLOY has, at each in-plant bulletin board, a small box containing 5x6-in. yellow slips. These are printed with the heading, "The Grapevine," and are addressed to the Editor of *The Carboloy News*. Ruled lines are provided on which the employee may ask any question about company operations, plans, or policies. If he signs it, he will receive a personal reply; if not, the question and answer will appear in the plant newspaper. This is a positive way to end the spread of rumors on the justly infamous "grapevine" that exists in every plant.

Inspection Aids

EX-CELL-O has an unusual application of a Ransome welding positioner—as an inspection test stand. Hydraulic assemblies mounted on the positioner table may be moved to any desired position for convenience . . . Test setups for hydraulic units in the same area involve a low table with motors permanently mounted under it so only drive sheaves project. Hydraulic assemblies are simply clamped on the table, with *their* sheaves projecting for the V-belt drive. As safety devices, "fire screens" of light-gage steel have been made. Sheet steel is bent to the desired block-C shape, edged with ⅛x1-in. plate, and provided with handles. Such a screen can be placed or removed easily. It sets on the floor, and is painted red as a further precaution.

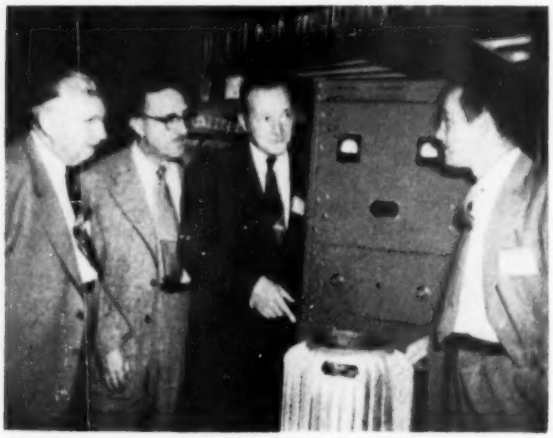
500% Dividend

AN ECHO of the Ford story (*AM*—Oct 12, '53): Only $28,000 went into Ford Motor at the start, none of it Henry Ford's; *he* had 17 patents and a brain. Alexander Malcomson invested $7000, but sold out for $175,000 because he didn't like Ford's idea for a cheap car. Such a gain was peanuts, because the company's original 6% annual dividends soon grew to monthly ones. The year-old company paid a 68% dividend, and soon each of the ten stockholders was getting $10,000 a month. 100% dividends were commonplace; one was 500%. Finally, Ford bought all the stock for $105 million, and everybody predicted a crash. Stockholders got $43 million in dividends that final year; next year Henry Ford paid himself dividends of $93 million.



News of Metalworking

TITANIUM MACHINING DEMONSTRATION with L O Montgomery (left) of Mallory-Sharon's Research and Development Laboratory machining titanium tensile test specimens with carbide-tipped tools. Looking on are James Pelouch and Frank Sykes of US Air Compressor Co



ULTRASONIC CLEANING DEMONSTRATION attracted considerable attention at the Show. Left to right: F C Young, Ford Motor Co, and W F Jominy, Chrysler Corp, gettting pointers on latest developments from W E Benninghoff and Harry E Osborn Jr, of Tocco Div, Ohio Crankshaft Co

Metal Show Breaks All-Time Records For Attendance, Number of Exhibits

CLEVELAND — More than $25 million worth of exhibits were studied by some 50,000 executives, engineers, metallurgists and manufacturing specialists attending the 35th National Metal Show at the Public Auditorium here Oct 19-23.

On all counts, this year's Show beat last year's records. This year there were 462 exhibits occupying 152,000 sq ft of floor space: last year 440 exhibits covered 114,000 sq ft. Last year's registration was 43,300: this year's was more than 50,000.

Four national technical societies sponsored the Metal Show and held concurrent technical programs: American Society for Metals, American Welding Society, Society for Non-Destructive Testing, and American Institute of Mining and Metallurgical Engineers' Institute of Metal Division.

The Show

The majority of exhibitors presented "dynamic" displays—machinery and parts in action, processes being demonstrated, metals and alloys being worked, formed, and cut. "Static" displays included such items as a lucite-encased model of the USAF J-47 jet engine, detailed miniatures of steel plants, and a magnesium casting with a pouring weight of 3500 lb. One exhibitor manufactured and distributed cigarette lighters. Another dressed its representatives in caps and gowns and conducted a "college" course on its product, complete with diploma.

Fields of major importance seemed to be the development of faster and more precise inspection methods and instruments, and metals and alloys with higher strength, higher temperature-resistance, and improved machinability. Everywhere evident was the increased use of the principles of optics, electronics, and air power.

Of particular interest was the emphasis on testing (*AM*—Mar 2, '53, p117; Jan 5, '53, p125). The increased speeds and feeds possible with new cutting tools and materials, together with the increased accuracy being demanded and produced, have led to a need being answered by the great number of exhibitors showing testing equipment. Predominating were instruments based on microscope and oscilloscope presentations of information obtained through the use of radiography, electronics, and ultrasonics.

There was also an effort to advocate simpler and more direct gaging methods (*AM*—June 22, '53, p121), as well as accurate testing at the machine (*AM*—Feb 2, '53, p95). Noteworthy among the latter were the air-gage machine tool attachments. Finally, the trend to miniaturization was evident in such devices as a ⅛-in. probe for a surface indicator and an optical pyrometer for measuring temperature of targets less than 1 mil in diameter.

Metals and alloys were displayed in the form of new-application products, rolled strips as thin as 0.0005 in., and composite metals in varied combinations (steel and titanium, tantalum and copper). Suggestions were made for handling hard-to-machine materials. Hardsurfacing alloys (*AM*—Aug 17, '53, p116) drew a great deal of attention, along with evidences of attention to finer and more attractive surfaces with a minimum of secondary finishing operations.

Coolants and cutting-oils were introduced to supplement the emphasis on cutting-tools and materials with higher strength and temperature-resistance and capable of faster feeds and speeds. Indications point to greater things to come from present research in the fluids field.

Of importance was the introduction of a cemented carbide cutting-

tool material claimed to step up heavy steel-cutting operations by 30% while providing 50% longer tool life.

Successful applications of titanium (*AM*—Sept 14, '53, p129) in making formed and machined parts were spotlighted. Titanium machining (*AM*—Feb 16, '53, p176); Mar 16, '53, p201) demonstrations obtained excellent finishes with carbide-tipped tools without using cutting-fluid.

Other trends noted include wider use of attachments that broaden the scope of standard machines, more complex joining methods (*AM*—Sept 14, '53, p126), growing attention to materials, tooling, and presses for '53, p130), importance of controlled-atmosphere metal treating powdered metal parts (*AM* — Sept 28, Jun 8, '53, p153), and the increased number and variety of ultrasonic cleaning machines and methods (*AM* —Jul 6, '53, p120). One ultrasonic machine exhibitor, using lower frequencies than usual, predicts the ultimate "piping" of ultrasonic-frequency supply through the shop.

The Congress

Four sponsoring technical societies held concurrent technical programs, as did the non-sponsoring Non-Destructive Testing Committee of the American Society for Testing Materials, and the Special Libraries Association.

American Society for Metals

Some 38 papers were presented during ASM technical sessions. A special feature of ASM's program was a two-day five-session seminar on Relationship of Properties to Microstructure. Speakers included Prof A H Cottrell, University of Birmingham, England; J H Hollomon, J R Low and E W Hart of General Electric Co; Prof M Gensamer of Columbia University; Profs E R Parker and J E Dorn and T Hazlett and C D Starr of the University of California; A D Schwope of Battelle Memorial Institute, G Slayter, Owens - Corning - Fiberglas Corp; Prof H H Ulig, MIT; L J Dijkstra, Westinghouse Electric Corp; and Prof J Libsch and G Conrad of Lehigh University.

Seven ASM papers dealt with titanium-base alloys.

James L Wyatt of Horizons, Inc, and Nicholas J Grant of MIT, speaking on surface hardening of titanium, claimed the most practical method is by ammonia nitriding. Nitrogen nitriding, they also reported, achieves results nearly as good. But time and temperature required to get comparable results with the nitrogen process are well in excess of those found in the ammonia method.

Messrs Wyatt and Grant's study of surface hardening techniques was made in order to decrease wear and eliminate galling and seizing during extrusion or wire-drawing operations.

This study showed that temperature, time and gas consumption are the three major inter-related variables in the ammonia nitriding process. Of the three, gas consumption is a function of nitriding temperature, constituting a secondary process variable. Too, there is an optimum thickness, with treatment periods greater or less than the critical time resulting in lesser case thicknesses, the authors concluded.

In another paper, W M Parris, P D Frost and J H Jackson of Batelle Memorial Institute reported that properties of heat treated titanium alloys depend upon composition, type of heat treatment and fabrication history.

At ASM's Annual Banquet, newly elected ASM President James B Austin, director of research laboratories, U S Steel Co, presided. Other new ASM officers are: Vice President G A Roberts, Vanadium Alloys Steel Co; Treasurer W A Pennington, Carrier Corp; and Secretary William H Eisenman. Medalists for 1953 are: Dr Hiland G Batcheller, ASM Medal for Advancement of Research; Dr George Sachs, Syracuse University, ASM Gold Medal; and William T Ennor, Aluminum Co of America, Albert Sauveur Achievement Award for 1953.

American Welding Society

More than 1400 members attended the annual meeting and technical sessions of AWS at the Hotel Cleveland. Re-elected president of the Society was Fred J Plummer, Hammond Iron Works, Hammond, Ind. Other officers: First Vice President J H Humberstone, Air Reduction Co; Second Vice President J J Chyle, A O Smith Corp; Treasurer Russell

NEW ASM PRESIDENT
J B Austin

NEW SND PRESIDENT
Gerold H Tenney

RE-ELECTED AWS PRESIDENT
F J Plummer

Metals Show (Cont'd)

S Donald and Secretary J G McGrath. Winner of AWS's Lincoln Gold Medal for 1953 is Walter H Wooding, Philadelphia Naval Shipyard.

Also honored by AWS were 13 winners of the Resistance Welder Manufacturers Association's technical essay contest. The Society's 1953 Adams Lecture was given by R B Shepheard of the Shipbuilding Conference, who spoke on "Aspects of Welding Research in British Merchant Shipbuilding." A total of 62 papers were presented during AWS sessions.

AIMME Institute of Metals

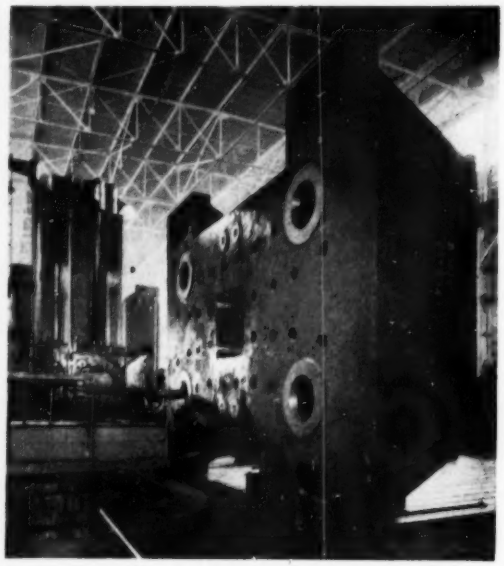
American Institute of Mining and Metallurgical Engineer's Institute of Metals held its annual fall meeting Oct 19-21 during the Congress. Technical program included several papers on titanium and its alloys.

Reporting on "Titanium-Base Alloys for Elevated Temperature Applications," F A Crossley and H D Kessler of Armour Research Foundation said that at least one ductile experimental alloy now shows creep resistance and rupture strength superior at 800 F to Type 410 stainless steel. Another alloy, they said, is superior to Type 410 at 1000 F but is not ductile. The authors pointed out a need for research on the influence of alloying elements on elevated temperature corrosion resistance.

Non-Destructive Testing

Society for Non-Destructive Testing, holding its 13th annual convention during the Congress, elected Dr Gerold H Tenney, Los Alamos Scientific Laboratory, president for 1953-54. Other officers elected were: Vice President William C Hitt, Douglas Aircraft Co; Treasurer Hamilton Migel, Magnaflux Corp; and Secretary Philip D Johnson.

SNT's Lester Honor Lecture was given by Dr Adair Morrison of Sprague Electric Co, who spoke on "Field Application of Radiography." The Society also conferred two new awards, the Coolidge Award for original x-ray work, and the Alfred Victor DeForest Award for outstanding contributions to non-destructive testing outside the field of radiography. First Coolidge award recipient, who received the award from the man for who it is named, William D Coolidge, was Donald T O'Connor, US Naval Research Laboratory. First DeForest Award was made to F H Doane of Magnaflux Corp.



MACHINING a 168,000-lb, 220-in. long x 66-in. deep x 192-in. high steel casting on an 8-in. bar horizontal boring mill at Lake Erie Engineering Corp, Buffalo. Casting will be used as bed or bottom platen for a 5000-ton laboratory press designed for advanced study of metals under pressure

Chip Breaking Report Published

CLEVELAND—Results of a two-year research project on chip breaking, conducted at the Sibley School of Mechanical Engineering under the auspices of the National Machine Tool Builders' Association, are now available in booklet form. Also available is a wall chart that can be hung in the tool room to give the men who grind carbide tools simple, clear instructions on optimum shapes, rake angles, clearance and dimensions of the chip breaker.

More than a score of prominent US machine tool building firms combined to defray cost of the research project and publication of its findings on three-dimensional chip flow. Heading the NMTBA committee in charge of the program is James C Hebert of Jones & Lamson Machine Co, Springfield, Vt. Carrying out the research program were Prof Erik K Henriksen and Director Harry J Loberg of Sibley School.

Copies of both the booklet and the wall chart may be obtained from the National Machine Tool Builders' Association, 10525 Carnegie Ave, Cleveland.

NEW BDSA HEADS SWORN IN BY SECRETARY SINCLAIR WEEKS (second from left) in ceremony at Washington October 15 included, left to right: Perin G March III, chief, Metalworking Equipment Division, Business and Defense Services Administration; Mr Weeks; Deputy Administrator H B McCoy; Assistant Administrator Walter A Edwards; Administrator Charles F Honeywell; and Assistant Administrator H J Wallace

Defense Tooling, Production, Apprentice Training Hold Spotlight at Four-Day NTDMA Convention

ASBURY PARK, N J—Executives from some 800 of the nation's leading tool and die shops were on hand for the Tenth Annual Convention of the National Tool and Die Manufacturers' Association, held here October 22-25, to discuss defense tooling, industry apprenticeship and production problems.

Principal speaker of the four-day meeting, John Slezak, Assistant Secretary of the Army (Materiel), in discussing "The Army and Special Tooling," said that the present program of storing productive equipment does not mean that the government is going to stop purchasing machinery and tools.

On the contrary, said Mr Slezak, the Dept of Defense has a $250 million appropriation for this purpose and the Army has $400 million to spend on expansion of production facilities, research and plant construction. However, he added, only a small percentage of this will go into new tools and dies. The reason: technological improvements constantly make dies obsolete and it would be false economy to tool up on items requiring engineering changes.

Because machine tools do not become obsolete as rapidly, a good proportion of defense appropriations will be spent on them. But, said Mr Slezak, the services will always be in need of special tooling for (1) equipping troops with modern weapons and materiel, and (2) keeping as well tooled up for ammunition production as funds will permit.

And, Mr Slezak concluded, the Defense Dept will buy tools and dies for standby plants as well as for current production. This will help prevent the tool and die industry from "falling into dark days as has happened in the past."

First general session, Friday afternoon, Oct 23, featured a panel discussion by NTDMA's Subcommittee on Apprenticeship on "Apprenticeship in Tool, Die and Machine Shops," with J Kleinoder of John Volkert Metal Stampings, Inc, as moderator.

Launch Apprentice Program

Discussion centered on NTDMA's new recommended program of apprentice training for the industry and included (1) ways of attracting apprentices, (2) selection of apprentices, (3) why it is profitable to train apprentices, (4) related training, (5) employer-apprentice human relations, (6) local committee functions, and (7) recommended apprentice standards for tool and die makers.

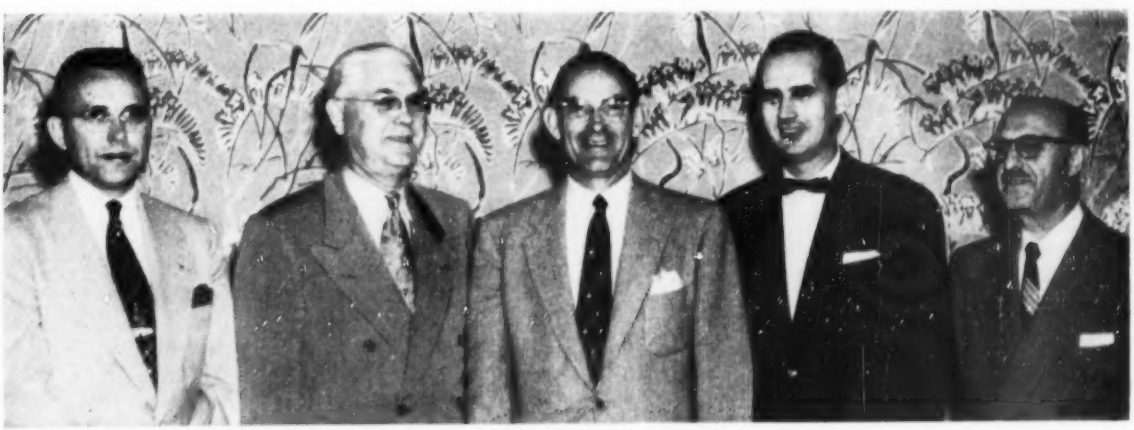
Following this was a skit titled "An Apprentice's Story—From Here to Security," with parts played by panel members. After a discussion period, NTDMA's new film, "Tool and Die Making—Keystone of Mass Production," was shown.

Saturday morning was given over to committee meetings on apprenticeship, industrial relations, membership, public relations and technical affairs.

Saturday's luncheon meeting featured presentation of testimonials and an amusing discussion of "What Makes a Star Salesman a Star" by H B Sharer, U S Rubber Co sales training specialist.

Final general session, on Saturday afternoon, led off with Allen R Fultz, superintendent of tools and methods, Eastman Kodak Co, Rochester, N Y, describing "Usual and Unusual Tool Room Measurements with Contour Projection." Concluding the session was a description of the "Rucker Share-of-Production Plan" by its creator, Allen W Rucker, Cambridge, Mass, management consultant.

Herbert C Murrer, president, Murrer Tool Co, Inc, Cincinnati, was elected president of NTDMA for the coming year; Jerome H Stanek, president, Stanek Tool & Mfg Co, Milwaukee, first vice president; Joseph N Huser, president, B & H Specialty Co, Indianapolis, second vice president; Albert Goldman, vice president, Atlantic Mfg Co, Philadelphia, secretary; and Philip R Marsilius, vice president, Producto Machine Co, Bridgeport, treasurer.



NTDMA OFFICERS FOR 1953-54 (left to right): Treasurer Philip R Marsilius, Producto Machine Co, Bridgeport, Conn; Second VP Joseph N Huser, B & H Specialty Co, Indianapolis; President Herbert C Murrer, Murrer Tool Co, Inc, Cincinnati; First VP Jerome H Stanek, Stanek Tool & Manufacturing Co, Milwaukee; Secretary Albert Goldman, Atlantic Mfg Co, Philadelphia. NTDMA's new officers were presented at the Oct 23 luncheon meeting

American Machinist Production Planbook And Inventory of Metalworking Equipment Out Soon

NEW YORK—The first complete picture of the effect the Korean War and the defense program have had on the amount, age, and distribution of metalworking equipment will be revealed this week with the publication of the Seventh *American Machinist* Inventory of Metalworking Equipment.

Co-featured with the Inventory in the Production Planbook are sections on the 1954 outlook for metalworking, planning and replacement, machine tools, tooling and portable tools, forming and forging; inspection, heat treating, joining and finishing; materials, parts and services, rebuilt equipment, and a review of prize-winning Practical Ideas appearing in *American Machinist* during the year.

The Seventh Inventory will be a feature of the 1954 Production Planbook, the Mid-November, 1953, issue of *American Machinist*. It will show in 160 tables and many pages of analysis the size and shape of the nation's metalworking facilities, industry by industry, and area by area, at the midpoint in 1953.

From the time of the first Inventory in 1925, the periodic studies have become increasingly comprehensive and have been of increasing importance in industrial, economic, and governmental planning. No exception, the Seventh Inventory is based on direct, detailed reports from more than one-fourth of the metalworking capacity of the nation. These have been expanded by formulas based on employment to give a complete picture of our metalworking potential.

A total of 165 types of equipment are reported, compared with 156 in the Mid-Century Inventory in 1949. The total number of machines of each type is reported for 16 industry groups and in 24 geographic areas. In each case the number of machines 10-20 years old, and the number more than 20 years old are also reported.

The general form for presenting the data that was adopted in 1949, and proved to be so much more convenient than earlier methods, has been retained. However, a number of modifications in presentation make the tables easier to read and more attractive. The graphs included with the analysis have also been improved to make the major conclusions easier to spot.

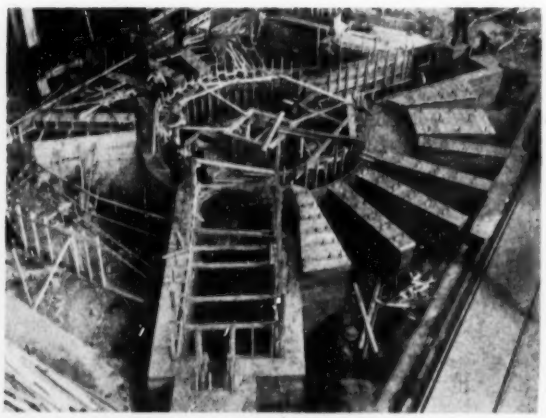
In addition to the reports on production equipment, expanded studies are included of metalworking equipment used for maintenance in other industries and for training in colleges and vocational institutes.

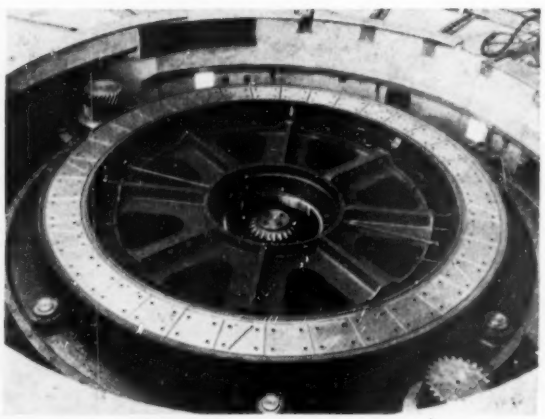
Compilation of the Seventh Inventory has been underway since last December. Reports were collected from more than 4500 plants with a total of two and a half million workers. A special staff of statisticians has worked since July to summarize the reports and expand the samples thus obtained.

HULL HEADS PRESSED METAL INSTITUTE

PHILADELPHIA — Samuel P Hull, VP, Worcester Stamped Metal Co, Worcester, Mass, was elected president of the Pressed Metal Institute at its annual meeting here October 7-10. James M Leake, president, Leake Stamping Co, Monroe, Mich, was elected vice president; and Hunter Morrison, Jr, VP, Morrison Products, Inc, Cleveland, was elected secretary-treasurer of the Institute for his third consecutive term.

Who Has World's Largest Boring Mill?





SHOWN DURING CONSTRUCTION is this huge boring mill at Dominion Engineering Co, Ltd, Montreal. This pedestal-type mill's cross rail can be lifted by two 60-ton cranes serving the bay. Maximum work piece is 52-ft in diameter with pedestals moved back, 42-ft with pedestals in normal position. The 25-ft diameter table was cast in two halves, will take a 200-ton load and an 18-ft-high workpiece. Speeds are 0.150 to 6 rpm. Table gear is a double helical, 20 ft-4 in. diameter. Table is supported by a single circular bearing and at the center by a 24-in.

Gear Manufacturers Discuss Standards At Semi-Annual Meeting in Chicago

CHICAGO — Extensive work on standards and proposed standards featured the 1953 Semi-Annual Meeting of the American Gear Manufacturers' Association at the Edgewater Beach Hotel here, Oct 25-28.

Attendance was upwards of 225—approximately the same as last year—but the program was much more extensive.

AGMA Offices Moving

One announcement of general interest during the meeting is the moving of Association headquarters from Pittsburgh to Washington next April 1, a shift that has been planned for some time. New address will be 1 Thomas Circle.

Three Technical Papers

Meeting technical sessions featured three general papers. The first of these outlined procedure in detecting "Surface Tempering Caused by Grinding," in which Gordon Murphy, Foote Gear & Machine Corp, said that tests he had undertaken indicated tempering as 0.030 to 0.040 in some areas, and rehardening to reformed martensite that makes premature gear failure a certainty. In most cases, Mr Murphy said, tempering was distinguishable only when the gear was etched.

Contributing factors, Mr Murphy said, are nature of grinding operation, wheel type, coolants, wheel speed and feed, work traverse speed, gear material variation, gear scaling or decarburizing and wheel sharpness. Major corrective devices, he added, are slower wheel speed and feed, faster work traverse and proper wheel sharpening. Wheels should be dressed by a sharp diamond with fast traverse, removing 0.002 to 0.003 in. in each of frequent dressings.

Special Etching Technique

A wheel that has been abused or glazed may require removal of 0.015 in. Most Foote gears, Mr Murphy said, are carburized 0.40-0.50 C alloy steel hardened to Rockwell C 50 or harder. Mr Murphy also delineated a special 12-step etching technique involving all-saline wash. 5% nitric acid etch and hydrochloric acid rinse. The etched surface need not be removed before the gear is used.

Tempering Indications

Indications of tempering, Mr Murphy continued, are particularly bad in such highly stressed areas as involute surfaces or root radii. If when indications are checked on the Rockwell 15N scale and found within hardness specifications, tempering is shallow and probably will not seriously affect gear life.

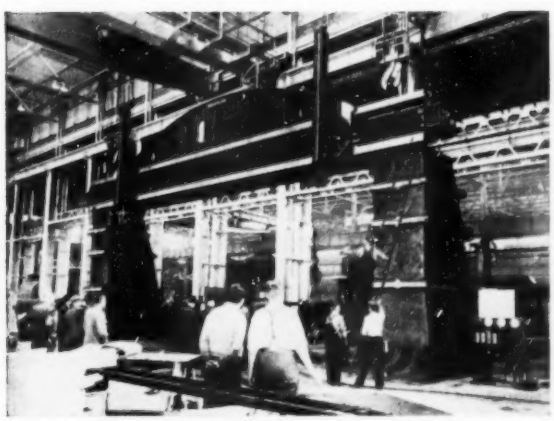
Grind-Tempered Gears

Discussion brought out that grind-tempered gears cannot be salvaged by re-heat treating, but can sometimes be saved by further grinding if excess backlash is permissible. Areas in which actual rehardening occurs fail in heavy service in one to five hours. Too high a finish adds to the hazards of tempering—it's safest to settle for 30 to 35 mu-in. Too soft a wheel, while it cuts the tempering hazard, also cuts accuracy seriously because of wheel breakdown.

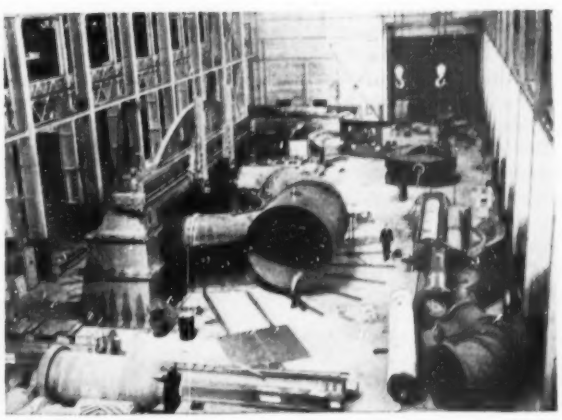
Other papers presented were by George McBride, Westinghouse Electric Corp, on the Harvard Business School Course for executives; and a paper on "Oversize Worm in Gear Hobs," by A H Candee, gear consultant, and Anthony Zamis, Illinois Tool Works.

Details will be included in the next issue if space permits.

Canada Claims Record for Its 52-Footer



thrust bearing and a 50-in. radial anti-friction bearing. Table lifting jacks interlock with electrical control. Machine is used to mill large hydraulic turbines. Dominion's Industrial Division Manager H M Black spotted items in the Sept 28 issue of American Machinist on S Morgan



Smith Co's 42-ft mill and on "Britain's Largest Machine Tool," a 41-ft vertical boring mill, promptly sent in the photographs on these pages with the claim that Canada's 52-footer is considerably larger. Can anyone beat Dominion's claim to the world's largest boring mill?

ODM Organizes New Agency to Deal With Upkeep of Mothballed Defense Plants

WASHINGTON — An inter-agency Defense Facilities Maintenance Board is being organized by the Office of Defense Mobilization for dealing with the upkeep of the nation's mobilization capacity.

Functions "Nebulous"

Right now, the Board's exact functions are pretty nebulous. The Board was actually created on paper last January by ex-Mobilization Director Henry H Fowler. It never amounted to much because adequate programs were being worked up in the regular government agencies for keeping strategic industrial facilities on standby.

Here's how the plans work:

- Wholly government-owned plants producing complex long-lead-time military goods are held intact for production readiness. The Cleveland Tank plant, which will soon close down, is an example.
- Government-owned machines and tools in private plants that can't be mothballed are stored as a package in the same plant or in nearby warehouses.
- Other government-owned production equipment is put in central storage depots.

These plans provide standby capacity in the form of government-owned plants or private plants equipped with government tools. However, they do not affect private plants producing critical defense goods — plants which have no government tooling and whose production has little if any civilian application.

Major problem to be dumped into the lap of the new board will be the matter of what government can do to assure continued availability of facilities of this type. Another: how to keep the facilities from becoming unusable for wartime production.

Lawrence Heads Board

The board's chairman will be William Lawrence, a government career man, now ODM's Assistant Director for Production Requirements and Programs. Representatives of the Defense Dept, Commerce Dept, General Services Administration, Atomic Energy Commission, other agencies dealing with defense problems will round out the board.

Recent cutbacks in military procurement have highlighted the problem DFMB now faces. Producers affected by cutbacks, who are not covered by the mobilization base maintenance program, are griping to ODM that strategic capacity in their plants will be lost unless additional defense business is given to them, or unless the government makes other provisions for keeping their facilities on standby. Examples of this include:

- A Detroit foundry which produced armored steel castings for integral Chrysler medium tank hulls. Chrysler is being dropped from the medium tank program.
- A West Virgina steel fabricator that added electric furnaces to its plant for production of shell steel. Next month, the Armed Forces will discontinue procurement of premium-priced shell stock.

Pentagon Takes Dim View

How DFMB is supposed to tackle problems like this is still unclear. The Defense Dept is inclined to pooh-pooh the matter. In the case of the Detroit foundry, Pentagon officials say the company can continue output of high-carbon steel for civilian markets and that maintenance of its shell-producing facilities is no problem.

The Pentagon views the West Virginia company's case in a similar light. The company normally produces steel rails and other railroad specialties, officials point out, and can use its own ingot output or seek civilian business. Additional military procurement of premium-priced shell stock from this company would amount to a $600,000 annual subsidy.

Defense Dept has told ODM it doesn't know how to identify plants with which DFMB will be concerned, and that short of direct subsidies, it can recommend little.

Could Use Vance Plan

Some officials suggest that the Defense Dept's $250 million Vance Plan fund can be used for acquisition of strategic production facilities in danger of being lost for defense purposes.

The question will really be answered only when Congress decides upon the degree of mobilization readiness that can be squeezed out of the national economy.

Metal Treating Institute Holds Annual Meeting in Cleveland

CLEVELAND — Approximately 100 representatives of 46 companies participated in two days of technical sessions at the 1953 Annual Meeting of the Metal Treating Institute here Oct 16-18.

Featured technical papers were presented on "Pressure Nitriding," by G E Mohnkern of U S Steel Co; "Flame Hardening," by Virgil Bullen, Cincinnati Milling Machine Co, and "Heat Treating Costs," by C H Hewitt of MTI's Cost Accounting Committee.

Decisive actions undertaken during the MTI Annual Business Session included establishment of a special fund for MTI research, and inauguration of an annual award for an outstanding technical paper.

C M Cook of Cook Heating Co of Texas, Houston, was elected president of MTI for 1953-54. Other officers elected were: Vice President C R Weir, Commonwealth Industries, Inc, Detroit; Treasurer L G Field, Greenman Steel Treating Co, Worcester, Mass.

Newly elected trustees of MTI are: H L Miller, B-M Heat Treating Co, Lyndhurst, NJ; C F Graham, Metal Treating, Inc, Milwaukee; K U Jenks, Lindberg Steel Treating Co, Chicago; Past MTI President A M Cox, Pittsburgh Commercial Heat Treating Co. Trustees carried over from previous years, whose terms expire in 1954 are: C H Muehlemeyer, O T Muehlemeyer Heat Treating Co, Rockford, Ill; and Fred Heinzelman, Sr, Fred Heinzelman & Sons, New York.

Flanders, Houser Honored at 3-Day National Standardization Conference

NEW YORK — American Standards Association, meeting here the week of October 19 for its Fourth National Standardization Conference, presented its two top awards to men who have done outstanding work in establishing metalworking standards—the Howard Coonley Medal in "recognition of outstanding services to the national economy through voluntary standardization" to Sen Ralph E Flanders (R, Vt), former president of Jones & Lamson Machine Co, Springfield, Vt; and the Standards Medal for "service in development of voluntary standards" to Col Perry L Houser, supervisor of manufacturing research, International Harvester Co.

Civilian Use of AE

In accepting the Coonley Medal, Senator Flanders spoke on the nation's atomic energy program and raised the question of whether the US "has not now reached the point of diminishing returns in the production of fissionable materials for military use."

Enough for Military Needs

If that is the case, Senator Flanders said, the government should inform the public that it now has enough fissionable materials to meet military needs, and should turn its attention to atomic energy for civilian uses.

"Ten times as much fissionable material as is required will not be ten times as effective in defending the nation," the Senator added. Commenting on ASA President Roger E Gay's recommendation that business should develop standards for industrial use of atomic energy, Senator Flanders said he believes health and safety standards should be developed immediately but "we are still in too early a stage for standards of dimensions and components in the field of atomic energy."

Standards to Prevent Chaos

Keynote speaker of the Conference, ASA President Roger E Gay urged US industrial management to adopt standards now that will avoid future confusion and unnecessary emergencies in future phases of the national economy.

"The alternative to building a comprehensive set of national standards now," Mr Gay said, "is to build them later in order to unscramble problems that never should have arisen." Mr Gay, like Senator Flanders, paid particular attention to the technical problems that are bound to arise from industrial harnessing of atomic energy.

Federal Standards Review

Vice Admiral G F Hussey, Jr, ASA managing director, said that the government has asked that ASA review federal specifications and make recommendations that will bring them into line with those of industry. This is being done, he added.

Technical sessions of the three-day conference covered purchasing, industrial noise, quality control, cataloging and palletizing standards.

Sen Flanders Roger Gay Perry L Houser

Plant Expansion

Pittsburgh Gear Co, subsidiary of **Brad Foote Gear Works, Inc,** is moving to enlarged quarters at Neville Island, Pittsburgh. The company expects to purchase some 50 new automatic gear cutting and hobbing machines, plus heat treating equipment, as part of its expansion.

Barrett-Cravens Co is combining operations of several of its plants into a 150,000 sq ft, $1-million lift truck manufacturing plant at Northbrook, Ill.

Rockwell Mfg Co has leased a 70,000-sq-ft, 3-story plant at Pittsburgh for expansion of its **Delta Power Tool** manufacturing operations and for absorption of its Crescent machine tool manufacturing operations.

Westinghouse Electric Corp plans to build a multi-million dollar packaged air conditioning plant near Staunton, Va. Anticipated completion date: June 1, 1954.

American Can Co officially opened its new Lemoyne, Pa., plant Sept 18 with government and civic leaders participating in a two-day ceremony. Plant, with rated production capacity of 400 million cans a year, will serve area fruit and vegetable packers and chocolate syrup producers.

Safety Socket Screw Co has added the second new manufacturing unit in two years to its Chicago plant. New addition will be devoted exclusively to socket screw making.

James H Knapp Co, Los Angeles industrial furnace manufacturer, has moved into a new 151,000 sq ft plant at 1731 Workman St, Los Angeles.

Packard Electric Division, GMC, will shortly launch the largest expansion program in its history. Project involves both new construction and expansion of present facilities and will extend the division's facilities to copper wire fabrication. Plans include a 200,000 sq ft copper rod, wire drawing and magnet wire fabricating plant.

Stanley Aviation Corp, Buffalo, will construct a $500,000 aircraft components manufacturing plant adjacent to Stapleton Field, near Denver, Colo.

TOOL AND DIE TECHNICAL SOCIETY FORMED

KENILWORTH, N J — A national technical society for the tool and diemaking industry, the American Society of Tool & Die Makers, has been formed here by Harvey Jacobsen, president, Jacobsen Manufacturing Co.

Purely technical in scope ASTD will not concern itself in any way with labor problems, political issues or similar affairs. Instead, ASTD will concentrate on dissemination of technical knowledge of latest practices in tool and diemaking.

Four-Point Program

To accomplish this objective, ASTD has formulated a four-point program: (1) publication of a monthly technical bulletin, (2) establishment of a free employment exchange, (3) setting up a lending library of tool and diemaking literature, and (4) establishment of a correspondence course in tool and diemaking, beamed at all levels from apprentice to supervisor.

ASTD has launched a membership drive, recruiting members from four categories:

- **Apprentices:** men taking part in four-year apprentice programs.
- **Junior:** graduates of a four-year training program or equivalent.
- **Senior:** graduates of a four-year training program with at least six years' shop experience.
- **Associates:** former tool and die men in any of the aforementioned three grades who are now in such associated fields as management, production, engineering, etc.

Officers of ASTD will be elected from the membership at the earliest possible date.

Speaking on the objectives of the non-profit ASTD, Mr Jacobsen said, "I wish to stress that ASTD is purely a technical society devoted to advancing the technology of the tool and die industry. It is designed primarily to serve the tool and diemakers themselves, rather than management." One of ASTD's primary objectives, he added, will be to formulate apprenticeship standards and policies for the industry.

Membership inquiries may be addressed to the American Society of Tool and Die Makers, Box 177, Kenilworth, N J.

Capital Expenditures to Stay High In 1954, McGraw-Hill Survey Shows

NEW YORK (McGraw-Hill Economics Dept) — Business's expenditures for new plant and equipment in 1954 will be only 8% under 1953's all-time record high. And the decline is attributable largely to cutbacks in defense programs. Thus capital investment for the coming year will hold up even better than anticipated.

If current plans for 1954 capital spending by the manufacturing, mining and utilities industries, which account for more than half of capital expenditures, are carried out, 1954 will be another banner year.

There is no evidence whatsoever of widespread investment cutbacks in anticipation of a business recession. Most expected declines are to be found in the steel and aluminum industries and other industries that have met their defense goals. Consumer goods industries, particularly, plan large expenditures for new machinery.

Main support for 1954 capital spending is being provided by large companies with long-range programs. Almost without exception, they are sticking to the same programs they reported in Feb 1953.

But smaller companies continue to cut back on plant and plant equipment, as they did in 1953. Only 40% of the companies participating in the McGraw-Hill survey upon which these figures are based plan to maintain or raise capital expenditures in 1954—and these are mostly the larger companies. Some of the very largest are even boosting their capital expenditures substantially.

New products appear to be the reason for high-level capital spending in 1954. These include completely new products, more capacity for recently developed growth products, and expansion or diversification of existing product lines. Big companies particularly are tending toward branching out into other industrial fields.

Several industries — notably automobiles, machinery, electrical machinery and petroleum—are holding within 10% of their plans as reported in the 1953 survey. The steel industry now plans to spend considerably more than it did earlier, because most companies have come up with further modernization projects. On the other hand, long-range planning is lagging behind in the chemical, food and textile industries.

Here's how metalworking capital spending plans stack up:

- **MACHINERY:** trends here are diverse, with some lines planning more capital outlay, others less. On the increase are office machinery, air conditioning equipment. Planning to spend less are companies making farm equipment, construction and mining machinery.
- **AUTOMOBILES:** largest increase of any field is planned here. The reason: auto makers are girding for a competitive struggle by installing automated equipment, adding facilities for automatic transmission, power steering, other special accessories production.
- **ELECTRICAL MACHINERY:** companies are still expanding to meet increasing demand for electrical growth products.

EXPENDITURES FOR NEW PLANT AND EQUIPMENT

(Millions of Dollars)

INDUSTRY	1953	1954	% INCREASE OR DECREASE
Chemicals	$1800	$1546	–14
Petroleum	2824	2757	– 2
Steel	1460	1108	–24
Automobiles	923	1063	+15
Other transportation	215	196	– 9
MACHINERY	899	805	–10
ELECTRICAL MACHINERY	463	512	+10
Food	841	841	0
Textiles	296	260	–12
Other manufacturing	2969	2595	–13
ALL MANUFACTURING	12,690	11,683	– 8

David Ayr

Fred H Johnson

Fred L Plummer

L Gerald Firth

Names in the News

David Ayr has resigned as president and general manager of the Hendey Machine Co, Inc, Torrington, Conn. He had been president of the Connecticut company from 1932 until 1952, when it sold its assets to the present New York company. Mr Ayr consented to remain for one year as president and general manager of the new company. One of the best known men of long standing in the machine tool industry, Mr Ayr is a past president and former director of the Connecticut Manufacturers Association. He is a director of the Waterbury-Farrel Foundry & Machine Co and of the Liberty Mutual Insurance Co. He plans to spend the winter in Florida.

Cliff G Hartke has joined Lynair, Inc, Jackson, Mich, as vice president in charge of sales.
Insurance Co. He plans to spend the winter in Florida.

Fred H Johnson has been appointed general manager of the Lufkin Rule Co of Canada, Ltd, Barrie, Ont; he succeeds **W H Wagner,** retiring after 50 years of service. Prior to joining the company in 1952, Mr Johnson was affiliated with the Marshall Wells Canadian Companies as vice president in charge of stores division, and most recently with the Marshall Wells Co of Duluth, Minn.

Fred L Plummer, director of engineering, Hammond Iron Works, Warren, Pa, has been re-elected president of the American Welding Society. **J H Humberstone,** vice president of Air Reduction Co, New York, has been named first vice president; **J J Chyle,** director of welding research, A O Smith Corp, Milwaukee, has been made second vice president; **Russell S Donald,** president, R S Donald, New York, will continue as treasurer of the Society.

Clare R Kubik, assistant to the president of Motch & Merryweather, Cleveland, has been named vice president for administration, as announced in AM Oct 26, p170.

W J Chamberlain, sales manager, machine tool distribution division, Motch & Merryweather, has been appointed director of company sales, as announced in AM Oct 26, p170.

L Gerald Firth has retired as vice president and director of research for Firth Sterling, Pittsburgh, after 39 years of service. An internationally known pioneer and authority on specialty steels and sintered carbides, Mr Firth introduced stainless steel to this country in 1914. In 1918 he became works manager of the company, and served as president and general manager from 1933 to 1947.

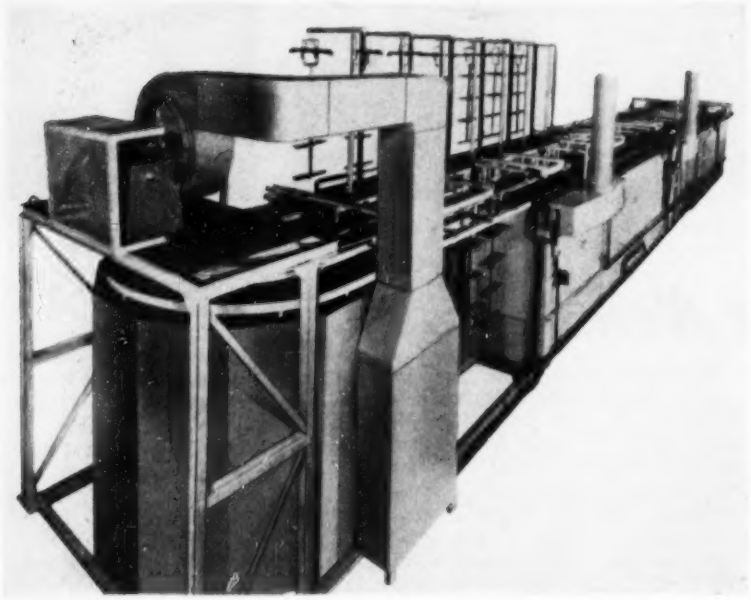
Brig Gen Stanley E Ridderhof, USMC (Ret) has been named vice president of Rosán, Inc, Newport Beach, Calif. He has been serving as assistant to the president.

OBITUARIES

Chester B Hamilton, 69, president and general manager of Hamilton Gear & Machine Co, Ltd, Toronto, Ont, died Oct 5. He served as representative for the Canadian Standards Association to the ASA in the field of gear work, and on American Society of Mechanical Engineers subcommittees on gear standards. During World War II he developed a substitute bronze for worm gears to conserve scarce tin, and offered industry free rights to utilize the analysis.

Ray A DeVlieg, 67, vice president in charge of manufacturing, Nash-Kelvinator Corp, died October 15 at his home in Detroit. Two weeks prior to his death he had resigned as an officer, but continued to serve in a consulting capacity. From 1926 to 1930 he served as Chrysler Corp works manager; in 1933 he became a director and vice president of Reo Motors. When Kelvinator and Nash merged in 1936, Mr DeVlieg joined the organization and became general works manager of the Kenosha, Wis, plant; he was named a vice president in 1941.

New Shop Equipment



unloading, pushers move the plated parts through a drying oven.

Lifting is done by a Hydromotor which is reversible, flexible in speed, and shockproof in starting and stopping. It is controlled by limit switches and solenoid valves. The carriage is moved by a hydraulic cylinder, the stroke of which can be varied, and decelerated at the end of the stroke by cam-controlled valves. Basic power is supplied by a single motor and hydraulic pump.

Two sets of controls are provided. Adjustable hydraulic flow valves control speed of each movement. Adjustable electric timers allow for varying dwell time or adjusting hesitation at the end or beginning of an immersion motion.

Because of the low power required, machine will stall before any serious damage can result from jammed work.

Wagner Brothers Equipment Co, Inc, Detroit, Ill

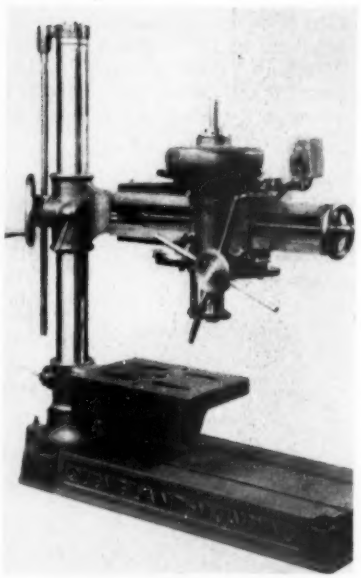
Automatic Plating Transfer Machine Employs Only Two Basic Motions

Wagner Brothers fully automatic electroplating machine was designed around the Lisowski transfer and conveying principle based on only two reciprocating motions, longitudinal and vertical. Machine will reportedly meet the majority of plating applications without necessity of special devices. However, should a process require a short immersion time at any one station, delayed setdown can be provided. Means of skipping a station can also be incorporated. Mechanical, air, or liquid agitation can be furnished for tanks such as bright copper or nickel. When extremely fast transfer time is necessary, a two-shaft machine can be supplied to permit extremely long dwell times in single station tanks and fast transfer of work from station to station.

All working parts are mounted on a central carriage which moves on a single track between the two rows of tanks and is actuated by a hydraulic cylinder. A shaft running the length of the carriage is fitted with gears which are meshed to racks on the work-lifting arms. This assembly provides the vertical motion which lifts work into and out of tanks. Synchronizing the movement of the lifting arms with the horizontal movement of the carriage provides the complete transfer of work.

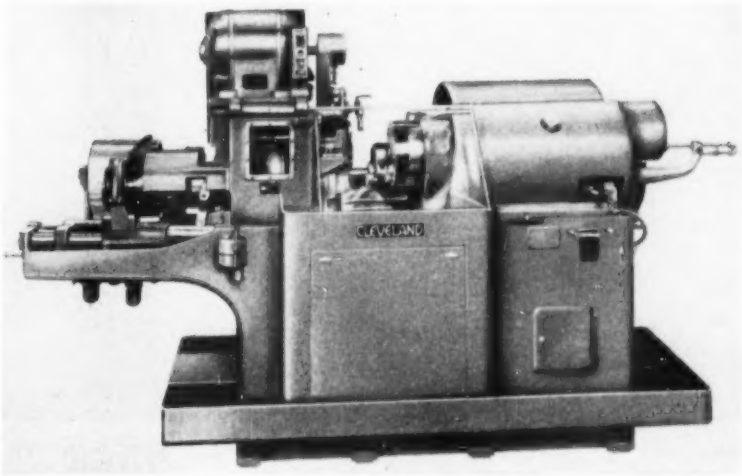
As lifting arms racks are meshed with central shaft gears on opposite sides, arms on one side are raised while those opposite are lowered. This effects balance of the load so that power requirements are considerably lowered.

In operation, plating baskets are hooked to work carriers resting on two cathode rails. Simultaneously, work is being lifted out of cleaning tanks, pickling tank, and plating tank along one side of the machine while being deposited in the next succesive tank along the other side. Where work is to remain for a period of time, carrier remains on cathode rails and is moved along by pushers, actuated by the reciprocating central carriage. When no current is required, rails are not electrified. Before arrival at station for



BENCH RADIAL DRILL (Munding) will be manufactured and sold by Cleveland Tapping Machine Co. Capacity in tool steel is 1½ in.; vertical travel of arm is 25 in.; horizontal travel of head, 18 in. Spindle travel is 6⅛ in. and eight spindle speeds vary from 160 to 3140 rpm — *The Cleveland Tapping Machine Co, Canton, Ohio*

Materials and Parts



Cleveland Single-Spindle Automatics Available in 2½-in. Model AW

Machine is said to provide efficient cutting speeds for every kind of metal and for all types of cutting by virtue of 40 spindle speeds ranging from 69 to 1920 rpm. Features include: Geneva turret index; universal camming; quick-change collets; hand-crank stock-feed adjustment; and four automatic speed changes, both forward and reverse, for each set of change gears.

Length of bar-stock feed can be set by hand and is indicated on a scale bar. Feed tube is mounted in a cartridge and attached to feeding member through a latch, thus providing quick method for changing feedshells. Master collet and collet pads are of Cleveland quick-change type which can be changed without removing master collet from spindle.

Front and rear cross-slides are widely and rigidly supported on machine bed to insure smooth, vibration-free operation under heavy forming cuts. Separate adjustable cam drums control forward and return motion of turret as well as that of the two cross-slides and an independent cutoff attachment.

Alloy steel work spindle is mounted on pair of precision Timken roller bearings using new semi-flexible mounting which compensates for any expansion which may occur under critical high-speed operation.

Cylindrical tool turret is accurately fitted into scraped bearing and has five holes bored in a 9-in. circle in line with work spindle. Each hole is provided with clamping bushings to hold tools securely. Variable turret feeds are obtained through improved mechanical drive.

Motorized chip conveyor is available and can be used to remove chips through an opening under the spindle head at the stock-feed end of the machine.

The Cleveland Automatic Machine Co, Cincinnati 12, Ohio

Collins Introduces Certificate Of Surface Plate Accuracy

Collins Microflat Co has introduced a certificate of accuracy to accompany each surface plate. By use of a British-made auto-collimator, optical readings are made which detect surface variations as minute as 0.000004 inches per inch. A part of the certificate includes a graph on which is plotted any deviation from true plane in millionths of an inch. Also included is a diagram of the 3-point suspension positions.

Collins Microflat Co, 2326 E 8th St, Los Angeles 21, Calif

... INCLUDING

Spherical roller bearing design reportedly achieves increase of 25 to 50% in capacity, three times longer service life.....page 190

Horizontal gear-shaving machine handles spur, helical, and herringbone gears with pitch diameters from 24 to 96 in. page 191

Automatic high-speed machine cuts hypoid, spiral bevel, and Zerol bevel gears from 2 to 8½ in. in diameter page 192

Double-end machine adapts to boring, chamfering, burring, milling, flaring, and spinning operations to produce 6000 parts per hr page 194

Radius tangent wheel dresser allows wheel to be dressed without unchucking work page 196

Self-clamping drill jigs in four types handle hole patterns from 3 to 15 in. in diameter page 198

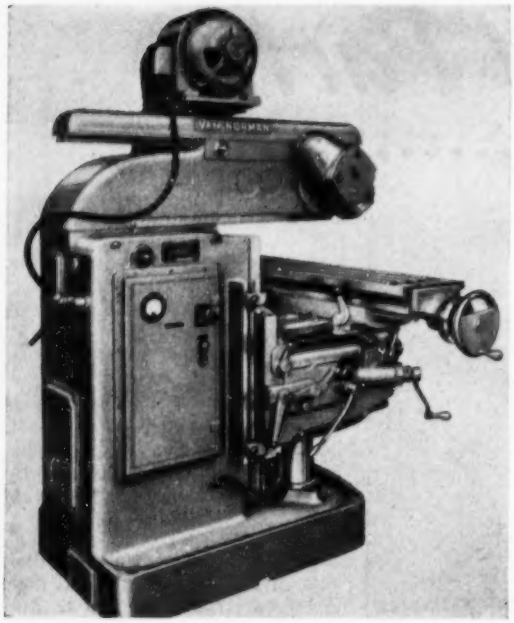
HSS drills are adjustable from 2 to 3 in. with one set of blades and from 3 to 4 in. with second set page 200

Vertical pressure-testing machines detect leaks in castings, as well as brazed, welded, and soldered assemblies page 204

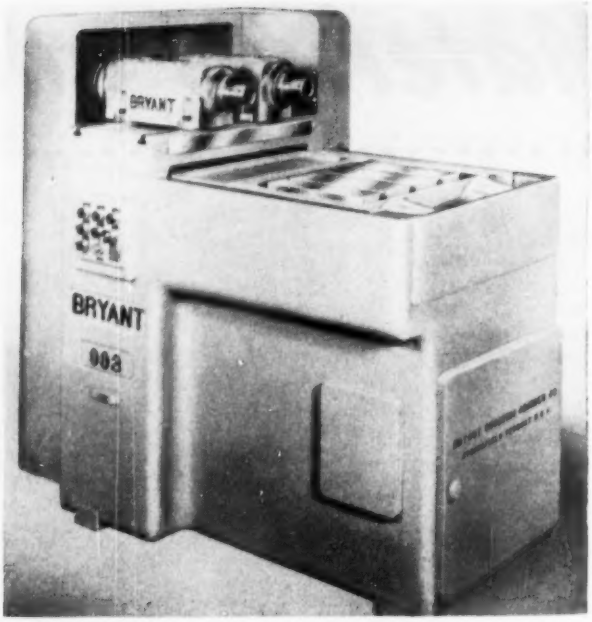
... and in Nov 23

Vacuum metallizer (72-in.-dia chamber), with three-stage pumping system, evacuates to pressure of ½ micron in seven minutes.

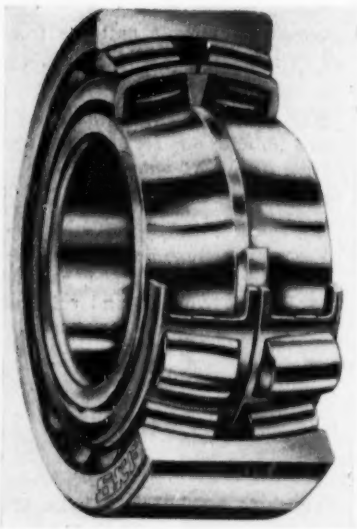
Milling and centering machine handles work from ¾ to 3½ in. in dia and from 5 to 48 in. long.



RAM-TYPE MILLING MACHINES, in four new models, have been designed for high accuracy, increased range, and long operating life. Adjustable cutterhead is incorporated to permit conventional horizontal, vertical, and angular milling. Features include: heavier base and column; larger table; saddle and knee assembly with feed motor mounted on side of knee; heavier rams with greater ram movement; and easily read dials. Loadmeter mounted on electrical control panel shows percent of cutting load — *The Van Norman Co, Springfield, Mass*



PRECISION BORING, precision drilling, straight- or contour-turning and boring, facing, and grooving can be accomplished on this model 998. Important feature is said to be freedom from vibration and smooth, uniform motion of table. Meehanite castings are used in construction and table moves on preloaded ball slides. Cams and change gears, for changing length of stroke or rate of travel, are easily accessible. Motors are mounted in accessible recess inside bed. Table measures 17½x22 in. and has three ½-in. T-slots. Design uses standard purchased parts—*Bryant Chucking Grinder Co, Springfield, Vt*



New SKF Roller Bearing Ups Capacity and Life

SKF "C" spherical roller bearings are reported to achieve an increase in anti-friction bearing capacity of 25 to 50% and give a service life 2½ to 3 times longer than the conventional type. Improvement has been accomplished without any change in size or weight.

SKF reports that thousands of the increased-capacity bearings are already in service and that over a long development period, successful applications have been made in railroad journals, vibrating screens, steel mill machinery, and other fields.

The inner race is designed without undercuts and integral flanges. Longer rollers are used with more effective contact between rollers and rings. Separate guide ring, between the two rows of rollers, allows them to take the position which their contact with the rings dictates. Each row of rollers is held in a window-type cage made of high-tensile-strength, cold-rolled brass. Each cage centers on two large areas, one directly on the inner ring, the other on the OD of the guide ring.

SKF reports that where combined loads are present, the improved spherical bearing is capable of carrying heavier combinations of radial and thrust loads, or pure thrust loads of greater magnitude.

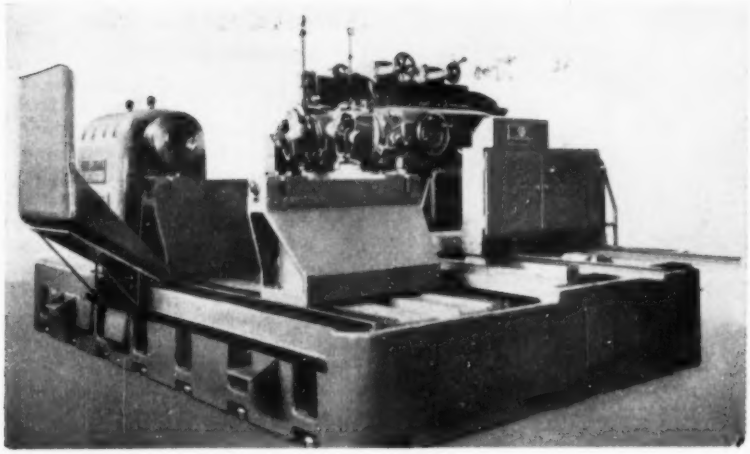
SKF Industries, Inc, Dept 616A, Philadelphia 32, Pa

Carboloy Steps Up Heavy Steel Cutting

Carboloy has announced a new grade 370 cemented-carbide cutting-tool material said to be specially suited for steel-cutting operations, such as work on rough castings and forgings. Grade 370 is claimed to step up heavy steel-cutting jobs by as much as 30% while providing up to 50% longer tool life.

The first of a new series of carbides, this material will stand up under heavy cutting pressures at temperatures as high as 1800 F. It is composed of tungsten carbide, titanium carbide, tantalum carbide, and cobalt; has a density of 12.60, a Rockwell hardness of 91.0 on the A scale. Carboloy expects to announce a second metal in the grade 300 series early in 1954.

Carboloy Dept, General Electric Co, Detroit 32, Mich



Improved Red Ring Horizontal Gear-Shaving Machine

Red Ring horizontal precision gear-shaving machine, model GCK-96, handles spur, helical, and herringbone gears having pitch diameters from 24 to 96 in. and with diametral pitches from 2 to 16.

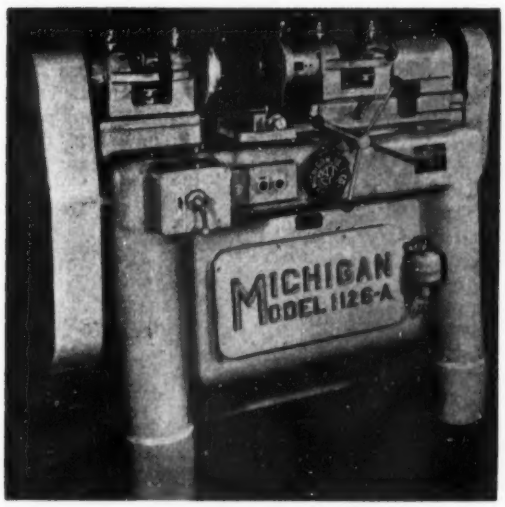
Improvements include: two cutterheads to speed herringbone gear shaving operations; rapid traverse feeds on both heads which reduce setup time; and redesigned controls that facilitate machine operation. Flexible workdriver and adjustable bearing pedestals permit large gears to be shaved by the rotary crossed-axes principle while mounted on their journal bearings.

Work platform of this machine rides on individual rails to avoid deflections in the saddle ways. A journal-alignment-checking bar is mounted in a slide in the saddle supporting the two cutterheads. Indicators for setting the cutterhead crossed-axis angle are provided. Cutter rotation inching lever is provided in each head to facilitate cutter entry into mesh with the gear teeth.

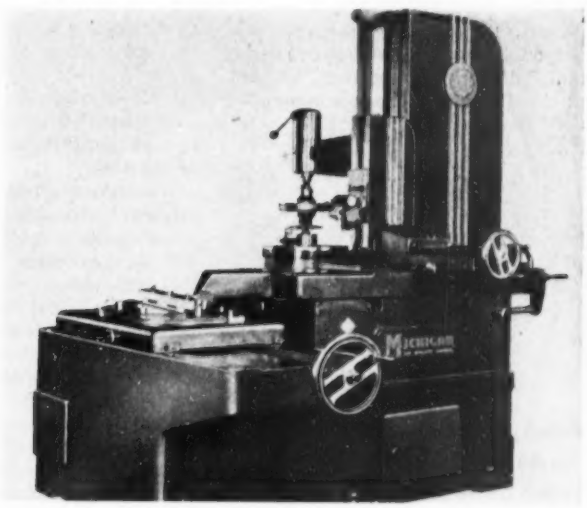
Duplicate pushbutton controls for all machine functions are provided in panels at side of each cutter slide. Pedestals that support the gear journal bearings are adjustable in all planes.

Machine will accommodate cutters up to 12 in. in diameter. Maximum shaving range is 111 in. Length from headstock to end of work bed is 170 in. Machine is 240 in. long, 210 in. deep, and 129 in. high and weighs approximately 150,000 lb.

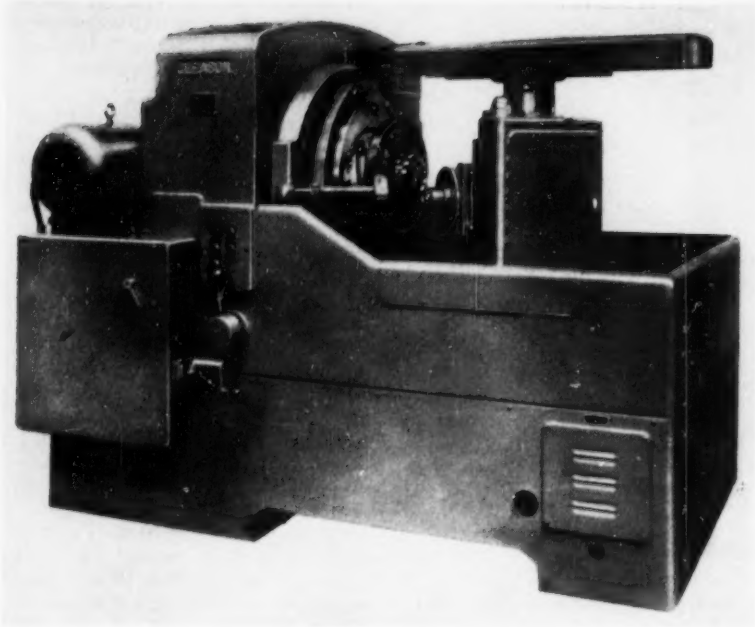
National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich



AUTOMATIC TRANSMISSION GEARS are production tested on models 1126 and 1126A Gear Speeders. The first has a single spindle driven while brake loads are applied to second spindle. Model A is equipped with individual drive and brake for each spindle; a sun gear is tested on the left-hand spindle at the same time a planetary gear assembly is being tested on the right-hand spindle. Double-action clutches change the spindle drive. Single-spindle model is driven by single-speed reversible motor. Model A is V-belt driven by a 5-hp, 4-speed, electrically controlled motor allowing for speeds of 600, 900, 1200, and 1800 rpm on each spindle — *Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich*



INVOLUTE CHECKER handles spur or helical gears with pitch diameters up to 36 in. and max spread between centers of 26 in. A single master disk, combined with a sine bar, provides proper ratio between master disk and base dia of gear being checked. Movement of sine bar table transmits motion of indicator contact tangential to base circle of gear. Simultaneous rotation of gear causes indicator to trace a true involute. Deviation from true involute is read directly from indicator. Removable bracket attached to indicator head holds fingers for checking tooth spacing. When used to check teeth in sequence, indicator is retracted and gear is indexed. Internal gears can be checked by replacing contact point with L-shaped extension — *Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich*



Gleason Hypoid Generator Cuts Gears to 8½-in. Dia

No. 106 hypoid generator is a completely automatic high-speed machine for cutting hypoid, spiral bevel, and Zerol bevel gears from 2 to 8½ in. in diameter. It is recommended for use with the Duplex Spread-Blade method, a high-production system for cutting each member of a gear pair from the solid in one operation. Generator is adaptable for cutting automotive spiral bevel and hypoid pinions, whether generated or formate.

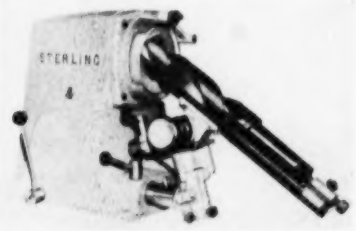
Generating motion is actuated by large cylindrical cam. Cutter spindle adjustments provide universal cutter tilt. Change gears are used to control amount of roll, ratio of roll, index, feed, and speed. Equipment includes double-acting hydraulic chucking attachment.

The cycle of machine operations is controlled by two cams. Feed cam effects depthwise motion of the work relative to the cutter, and the generating cam actuates the generating roll. Cams provide cutting cycles adapted to type of work to be done; those available will produce a completing cycle and several types of single-roll cycles.

Capacity figures include: root angle setting from +90° to −12°; max diametral pitch of 4; full depth, using standard cutters (1½ to 7½ in.), of 0.500 in.; and index range of 5 to 97, including most numbers to 175.

Feed varies from 3.5 to 50.4 sec per tooth; cutter speed is from 84 to 380 fpm.

Gleason Works, 1000 University Ave, Rochester 3, NY



Bench Unit Grinds ⅛- to 2½-in. Drills

Model DB bench-model drill grinder operates on same principle as model DA but is a single-purpose machine without the carbide tool grinding feature.

Unit has a capacity for ⅛- to 2½-in. drills and handles 2-, 3-, and 4-lip drills without changing setup. No collets or jaws are required to hold drills.

Grinder includes built-in diamond wheel holder for accurately dressing the wheel. Straight cup wheel, 6x1½x½ in., with 4x1-in. recess is used. Motor is ½ hp.

McDonough Mfg Co, Eau Claire, Wis

Chicago-Latrobe Gun Drills For Deep-Hole Drilling

Carbide-tipped gun drill advantages for deep-hole drilling are claimed to be: enables drilling of deep holes that would otherwise be impossible to drill; minimizes runout by maintaining closer drilling concentricity; produces a finish and hole size that in many instances are comparable to those obtained by reaming; increases production due to higher speeds and longer tool life.

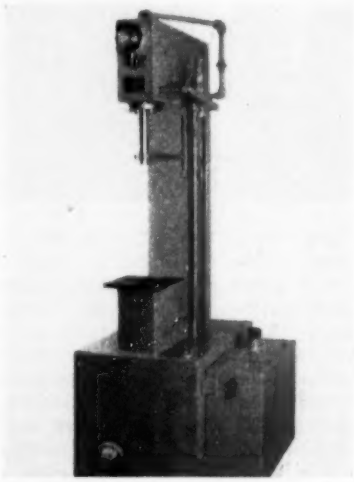
Chicago-Latrobe, 411 W Ontario St, Chicago 10, Ill

Clifton Hydraulic Presses In Various Models and Sizes

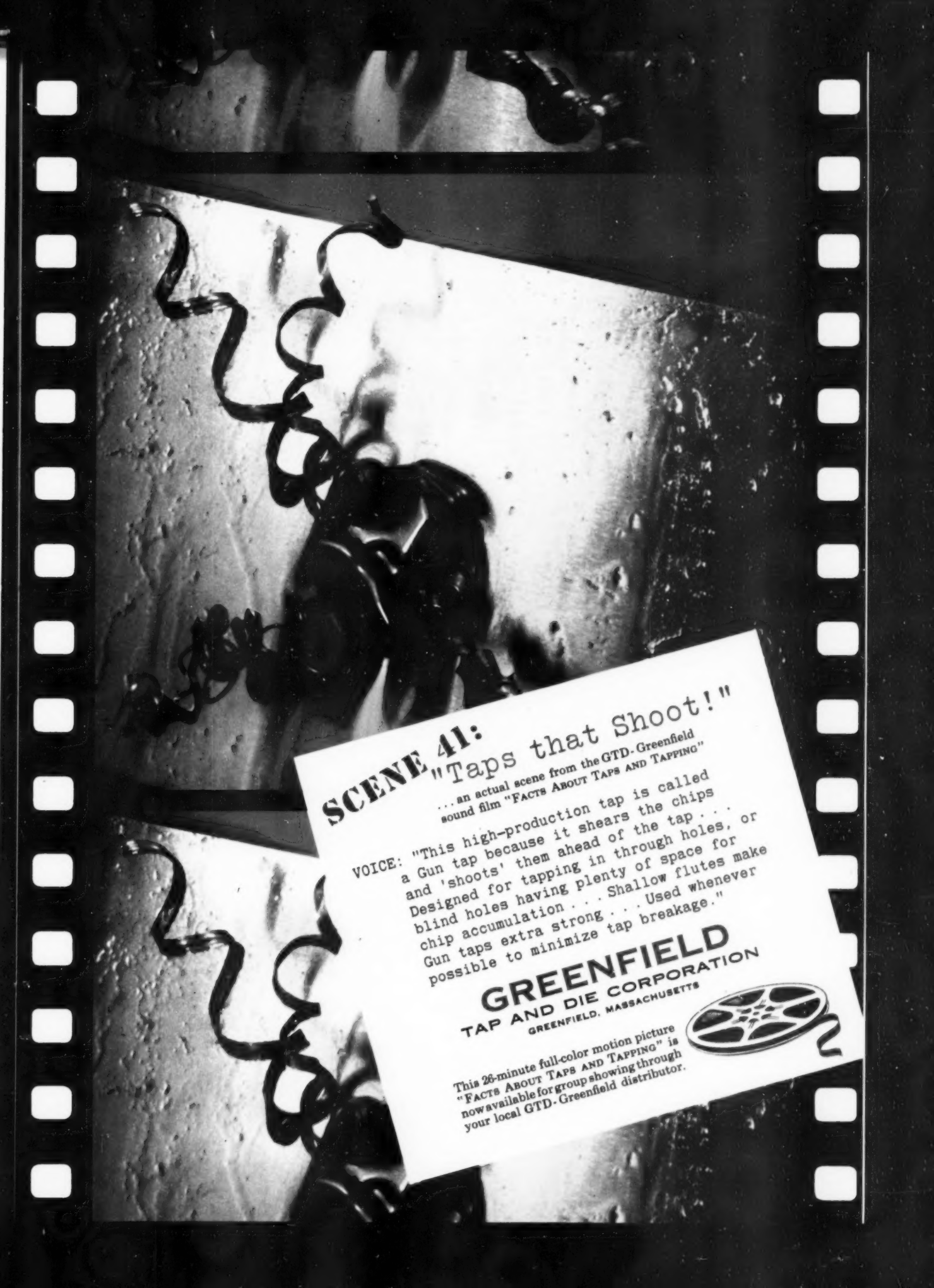
Hydraulic press illustrated is Model 11 featuring a dual-pump hydraulic unit providing the low-pressure, high-volume system necessary for rapid advance of the ram. Ram can be adjusted for length of stroke both down and return and includes automatic changeover to the high-pressure pump for pressing at full capacity. Press is foot-operated and leaves both hands free. Pressure regulator is standard equipment. Capacity is 10, 15, 20, or 30 tons with strokes of 10, 10, 12, and 15 in.

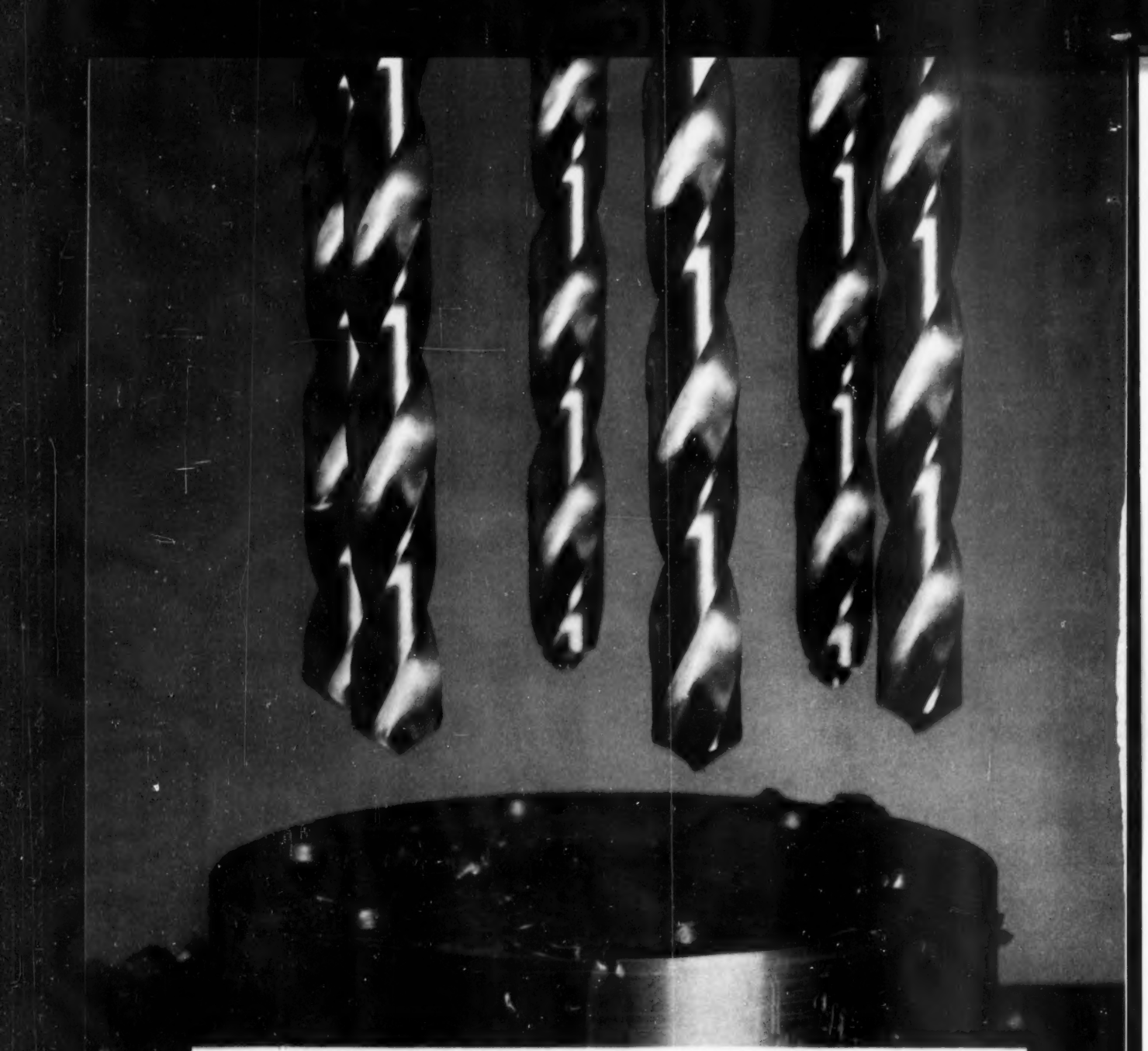
Other models in the Clifton line include a self-contained, down-acting production press with capacity from 75 to 200 tons and various self-contained hobbing presses which feature Unitrol. Unitrol is a complete hydraulic circuit eliminating two-hand control and regulating both pumps. No piping is used in the circuit.

Clifton Hydraulic Press Co, 287 Allwood Rd, Clifton, NJ



MODEL 11 of Clifton hydraulic press line which features hydraulic circuit regulating both pumps and eliminating two-hand control.


SCENE 41:
"Taps that Shoot!"
... an actual scene from the GTD-Greenfield sound film "FACTS ABOUT TAPS AND TAPPING"
VOICE: "This high-production tap is called a Gun tap because it shears the chips and 'shoots' them ahead of the tap . . . Designed for tapping in through holes, or blind holes having plenty of space for chip accumulation . . . Shallow flutes make Gun taps extra strong . . . Used whenever possible to minimize tap breakage."
GREENFIELD
TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
This 26-minute full-color motion picture "FACTS ABOUT TAPS AND TAPPING" is now available for group showing through your local GTD-Greenfield distributor.



WHY POLISHED FLUTES?

One of the functions of drill flutes is, "to permit passage of chips", according to the official definition of drill terms.

As an aid to this function in sizes over one-half inch, all GTD-AMPCO Drills, both catalog listed and special, are regularly furnished with polished flutes.

The smoother surface of polished flutes results in better chip slippage, lessens friction heat and tends to lower power consumption.

You can have the advantages of polished flutes at no extra cost by specifying GTD-AMPCO Drills.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

One demonstration, and key men agree

NEW Scott Industrial Wipers

Most plants have found a 90-day trial—with a Scott representative working hand in hand with their supervisory personnel—the most accurate way of measuring the advantages of Scott Industrial Wipers.

are better than anything they've ever used for most industrial wiping jobs.

We expected that years of testing and research had made this a good product. Still, we never thought that Scott Industrial Wipers would catch on so quickly with so many key men in so many different kinds of plants.

Scott Industrial Wipers have only been on the market a few months. But, already, Plant Managers and Superintendents, Industrial and Methods Engineers, Production Supervisors, Head Storekeepers, Purchasing Agents—as well as the workers themselves—have been enthusiastic about them. Here's why:

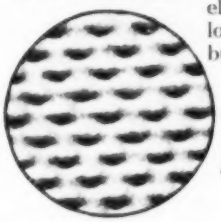
Safety — Scott Wipers are disposable. This means that harmful filings, oils, and shavings are thrown away, along with the used wipers. Clean edges reduce chances of catching in moving machinery.

Cleanliness — Because a new clean one is always available, you can have a wiper free from chips and foreign matter thus helping eliminate the carrying of dermatitis.

Uniformity — Each wiper is of standard size, color and absorbency. Every inch is a highly effective wiping surface. From experience you will soon know the exact wiping requirements of each job.

Versatility — Soft but strong, Scott Industrial Wipers tackle almost any job . . . from oil wiping and glass wiping to polishing and use on the face and hands.

Cost control — Naturally, with sorting and counting eliminated, expensive controls are no longer necessary. Wiping now can be a budgeted production operation.



Close-up of wiper surface showing "PERF-EMBOSSED" texture which grips dirt and assures thorough cleaning

For further information, fill out the coupon and mail to Scott Paper Company, Chester, Pa. AM-A

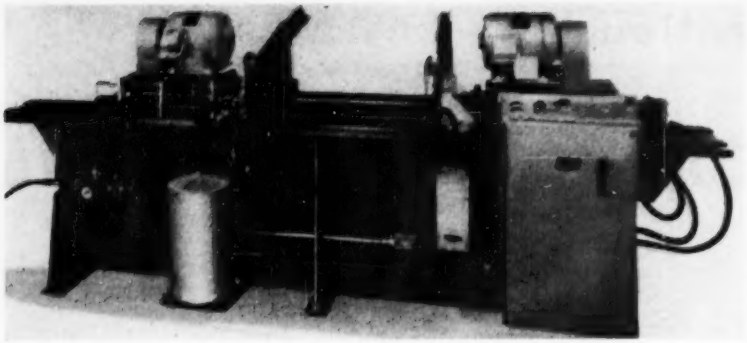
Name_____

Position_____

Company_____

Address_____

City_____ State_____



Double-End Multi-Operation Machines Produce 6000 Pieces per Hour

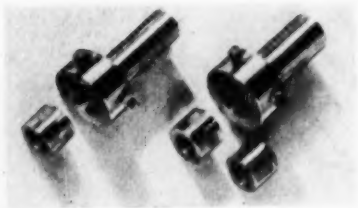
Walter P Hill has announced a new line of double-end machines said to be ideally adapted to boring, chamfering, centering, burring, milling, flaring, and spinning operations. Machines are available in a variety of sizes to suit individual requirements. Production rates in excess of 6000 pieces per hour are the result of the hydraulic-powered magazine feed arrangement and unique motorized heads equipped with hydraulic feeds. Spindles resist unbalanced thrust loads up to 14,000 lb.

Pieces requiring machining operations on both ends are loaded into the magazine and fed one at a time to be chucked in a stationary position by the action of a hydraulic cylinder controlling fingers and chuck jaws. Two air cylinders at each end of the fixture act in conjunction with the hydraulic cylinder to provide uniform tension. Power heads rest on flat ways on machine bed and are adjusted to a position to suit the length of the part being machined. When work is positioned, cutter spindles are automatically positioned to compensate for part length variations.

Spindles in the power heads are supported in a 14-in. sleeve by tapered roller bearings. Hydraulic cylinders at rear of each head control feed of spindles through guide rods attached to front of spindle sleeve. Spindle is driven by a spline-hole V-belt pulley and adapter assembly mounted in Meehanite head with two ball bearings. A sliding spline fit is provided between the spindle end and the V-belt pulley adapter.

Machine illustrated chamfers both ID and OD, and faces both ends, of 3/16 to $\frac{5}{8}$-in. diameter metal tubing from 3 to 40 in. long. It is 12 ft long, 2 ft deep, and $4\frac{1}{2}$ ft high. Each head is powered by 3-hp motor.

Walter P Hill, Inc, 22183 Telegraph Rd, Detroit 19, Mich



Tool Adapter For B&S Automatic Screw Machines

American Cam Co announces the introduction of a new precision-ground tool adapter for Brown & Sharpe automatic screw machines. With only two adapters in place of the conventional six it is now possible to use No. 00 tools on No. 0 machines and either No. 00 or No. 0 tools on No. 2 machines.

Reduction to two sizes is accomplished by means of interchangeable self-locating bushings which are hardened and precision ground. Both adapters and bushings are made of finest alloy steel.

American Cam Co, Hartford 1, Conn

Fire Extinguisher

Fire extinguishing agent has been introduced which is said to be several times as efficient as carbon tetrachloride, with a much lower toxicity level. Compound is known chemically as methylene chlorobromide, and is commonly referred to as "CB."

Eston Chemicals Div, American Potash & Chemical Corp, 3030 W 6th St, Los Angeles, Calif

Air-Powered Jig-Vise Multiplies Airline Pressure

Jig-Vise clamping pressure is ten times airline pressure and can be controlled by varying airline pressure from zero to maximum. This feature permits the handling of thin-walled plastics as well as heavy sectional material. Double-acting air cylinder exerts equal pressure and speed in either direction. Production operations requiring an upstroke have the same advantage of variable speed and pressure as the downstroke.

The air-controlled valve is an integral part of the unit to assure instantaneous response of the clamping

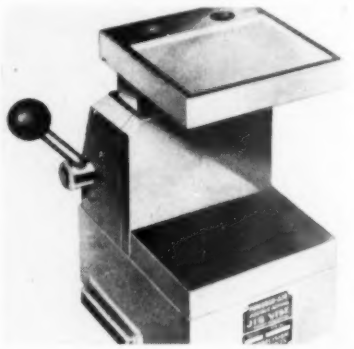


plate. Exhaust air can be used to clean chips from the nesting plate.

Clamping and nesting plates are keyed for accuracy of position. Any set of plates can be replaced without loss of original accuracy. Each change of the nesting and clamping plates transform unit into another tool. Jig-Vises are made of aluminum, cast iron, and stainless steel, with all moving parts precisely machined and completely enclosed. Two sizes of nesting and clamping plates are available.

SuPrecision Products, 2447 Nicollet Ave, Minneapolis 4, Minn

BEL CONNECTOR is cast-iron fitting which encloses pipe leak within captive Neoprene gaskets when four screws are tightened. Fitting exerts no pressure on leak or surrounding weakened area. Two types handle straight-section and pipe-to-elbow leaks. Device is tested safe at 150 psi — *Holoal Mfg Corp, Box 95, Bellerose 26, NY*

LONG LIFE!

GISHOLT

1

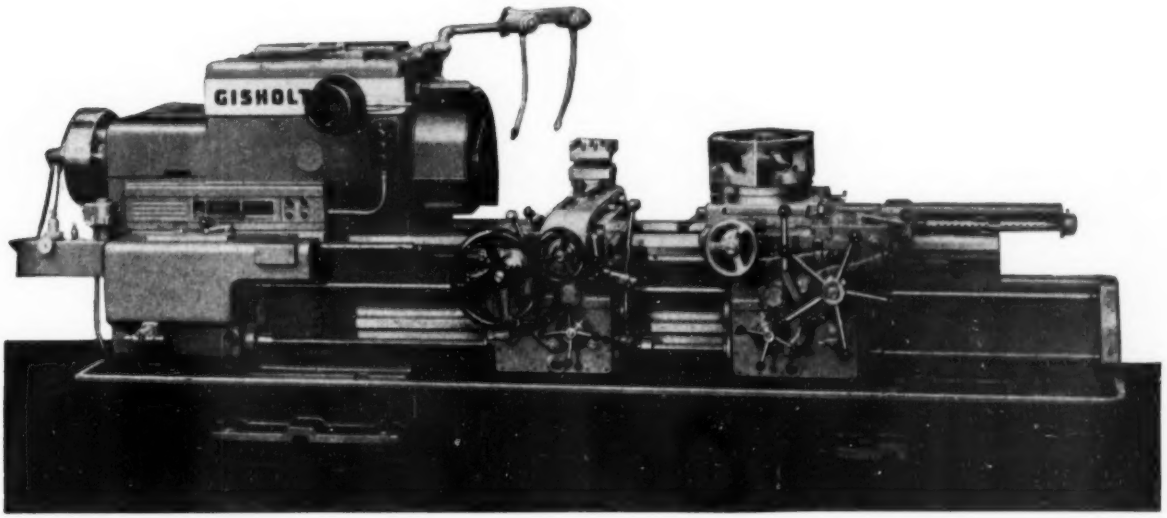
All gears in Gisholt turret lathe transmissions are high carbon alloy steel, precision ground after heat-treatment to assure long wearing quality. All shafts turn on antifriction bearings, with pressure spray lubrication. Headstock is cast integral with bed for extreme rigidity—to maintain accurate, permanent alignment.

2

Gisholt's thick, block-type ways are automatically pressure lubricated. Made of SAE 52100 tool steel, they are deep hardened to 64-66 Rockwell C and then finish-ground for exact alignment with the spindle. On top, bottom and both sides, they present a bearing surface that is virtually wear-proof—accurate for years to come.

3

Aprons are fully enclosed, all working parts protected and operating in a continuous cascade oil bath. Alloy steel gears and shafts are mounted on antifriction bearings. Positive serrated feed and traverse clutches cannot slip or drag. Safety shear pins protect feed and traverse mechanism against overload and accident.

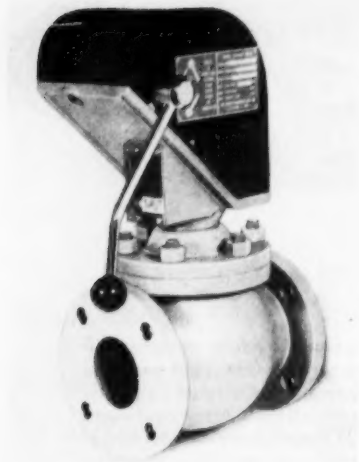


You'll find all the speed and easy operation you want in these new Gisholts. But you want long life, too. Here's the lasting accuracy, freedom from repair bills and proved performance that protect your turret lathe investment for years to come.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



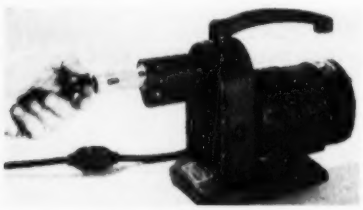
Compact Shut-Off Valve Is Solenoid-Operated

Solenoid-operated model of North American series 22 safety shut-off valve is a globe valve, intended primarily for use in gas or oil lines, available in standard pipe sizes from ¾ through 6 in. Valves up to 2-in. size have threaded connections, larger valves are flanked.

Valve extends 3⅞ in. on one side of pipe, 4⅜ or 5⅛ in. on other side. Mechanism may be rotated relative to valve body to take advantage of short dimension in another direction. Valve may be mounted vertically as well as horizontally and, if mounted overhead, may be operated with chain and reset wheel.

Valve mechanism will withstand ambient temperatures of 167 F and oil heated to 250 F may be passed through valve itself. Optional accessories include auxiliary switch which may be wired to give signal when valve shuts.

North American Mfg Co, 4455 E 71st St, Cleveland 5, Ohio



Bench Model of Taft-Peirce Power Thread-Gaging Unit

Bench model gage for checking internal threads is companion to original Rotocheck power thread-gaging unit. Gaging assembly is mounted directly on electric motor unit. Portability is facilitated by lightweight construction and handle directly above motor.

Work is brought to unit and a slight forward pressure causes the gaging member to screw into the part automatically at the rate of 4 revs per sec. Reversal of applied pressure causes immediate disengagement or reversal of drive, as desired. To prevent danger of damaging parts, a specially designed clutch provides torque control.

Standard spindle will accommodate AGD tapers No. 00, No. 0, No. 1, and No. 2, covering a range of thread gages up to 0.510 in. nominal dia. Special adapters are available for reversible thread plug members and for adapting gage to checking of external threads.

The Taft-Peirce Manufacturing Co, Woonsocket, RI

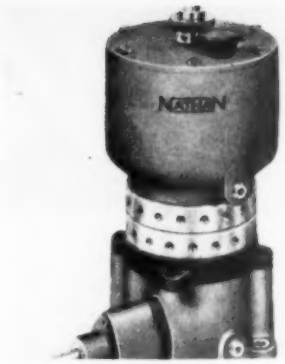
Adjustable Drill Guide for Power Tools or Drillpresses

Sine adjustable drill guide has a depth stop that can be set to any required depth from ¾ in. on hand tools to 1¼ in. when mounted on a drillpress. Unit is made of aluminum and has reportedly proven to be valuable on jobs where a large number of small-diameter holes have to be drilled. With this attachment, it is not necessary to use drill bushings in the jig plates as the pilot is designed to accept the desired drill size and thus take the place of the bushing.

Drill breakage is reduced to a minimum because drill is running inside the pilot when entering any hole in the jig plate., As pressure is applied to the drill motor, pilot slides into body housing bushing and allows drill to enter stock. Pilot is designed so that it does not turn with the drill.

To drill out improperly formed round or universal head rivets pilot is made with inside chamfer that makes it easier to locate drill on rivet center. With an outside chamfer, attachment may be used for centering holes in a countersink.

E & E Engineering Co, 15023 Harper Ave, Detroit 24, Mich



Lo-Flo Lubricator Delivers Lubricant to 36 Points

Lo-Flo automatic precision lubrication system is capable of delivering minute quantities of lubricant to as many as 36 different points, regardless of individual pressure differences. It is available in 18- or 36-feed models, with or without group regulation of feeds.

Flow rate per feed ranges from 2.3 cu in. per hr to less than 1 cu in. per 700 hours. Usable lubricants vary from light oils to light grease at 60 F. Outlets can be manifolded internally to increase flow to selected bearings and unit can be used with separate or integral reservoir.

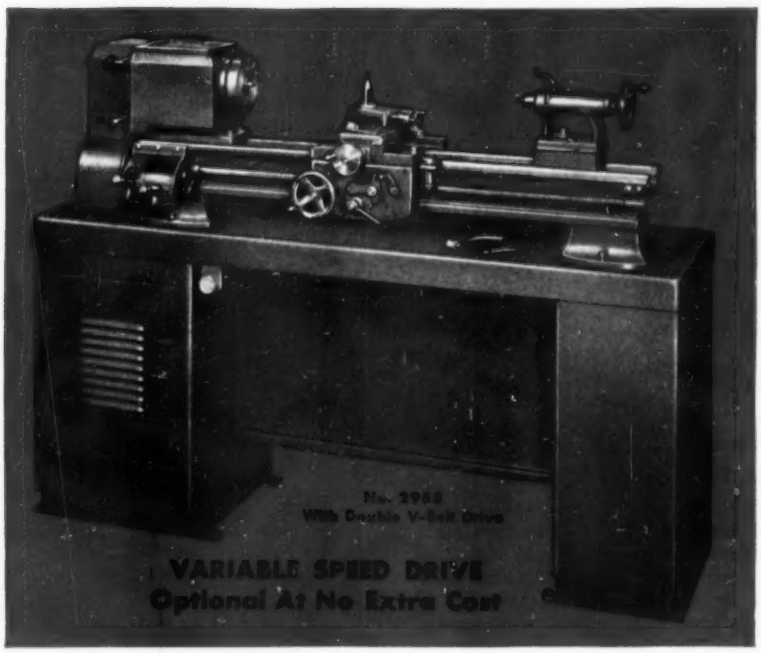
Lo-Flo is available with a number of drives, including rotary shaft, built-in rachet, solenoid, and pressure pulsation of liquids or gases. Unit has self-lubricated construction and is self-priming. With 500-psi working pressure and 1000-psi relief, there is sufficient pressure to overcome line blocks.

Nathan Manufacturing Corp, 416 E 106th St, New York 29, NY

RADIUS TANGENT WHEEL DRESSER is mounted on spindle allowing operator to dress wheel at desired radii without moving work from chuck — *Spike Manufacturing Co, 24609 Middlebelt Rd, Farmington, Mich*

VERSATILE 12" SWING LOGAN LATHE

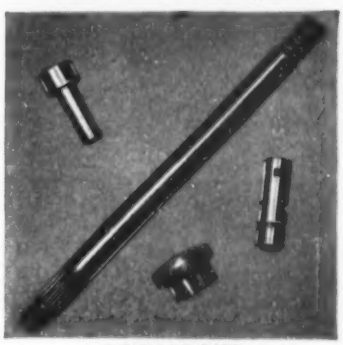
FOR PRODUCTION, TOOL ROOM, MAINTENANCE, SCHOOL SHOP



In versatility, accuracy and value, this 12" Logan Lathe is *new*. Wide speed range, sustained accuracy, and rigidity on heavy cuts are inherent in its massively proportioned ball bearing spindle construction. Its heavy headstock, double V-belt drive, and heavy-ribbed bed with two V-ways and two flat ways precision ground to within .0005", mean lasting accuracy on production lines. The completely machined saddle and large, accurate dials are typical of the features which adapt it to exacting tool room work. With 1" collet capacity, 1⅜" spindle hole, and either 23" or 35" center distances, the 12" Logan has the size to meet most shop requirements. Simple and safe to operate, it is well adapted to student training. In brief, this 12" Logan can put new efficiency and more profit in your lathe turning operations.

SMOOTH
On Heavy Cuts

With smooth power this 12" Logan hogs out a .375" cut from bar stock. Extra weight in the headstock . . . a massively proportioned spindle turning on oversize ball bearings assure the rigidity and sustained accuracy that makes heavy cuts easy.



ECONOMY
In Production

Typical parts made on Logan Lathes and held to closest tolerances at minimum cost per finished part. Rugged, accurate Logan construction keeps production lines going at top efficiency.

SEE IT AT YOUR LOGAN LATHE DEALER'S, OR

Write for Information . . .

Full catalog descriptions and price information on request.

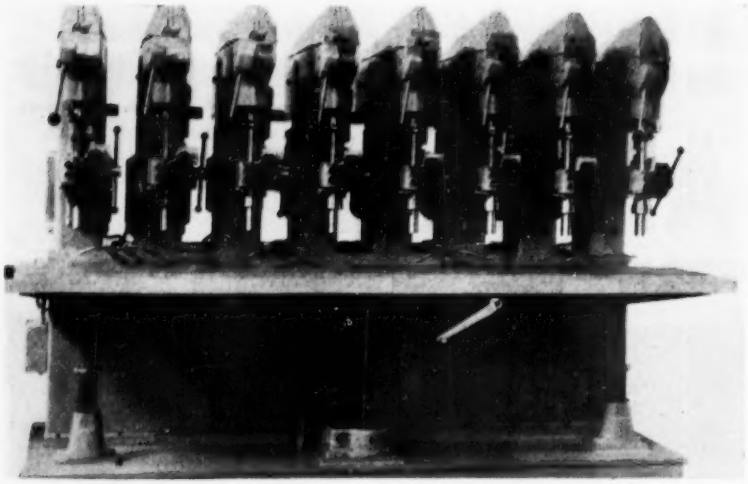
Write today to

Logan ENGINEERING CO.

Brief Specifications

Swing over bed and saddle wings, 12" . . . Center Distances, 23" and 35" . . . Turret Lathes Models have 43" bed length . . . 1⅜" spindle hole . . . 1" collet capacity . . . 16 V-belt drive spindle speeds, 35 to 1230 rpm. . . . Variable speed drive, infinite spindle speeds, 38 to 1575 rpm.

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS



EIGHT-SPINDLE DRILLING MACHINE (Avey No. 2 BMA-6) has 12-in. spindle overhang, 15-in. center distance between spindles, 7-in. head travel, and 6-in. rack travel. Spindles are individually driven by 2-hp, 1200- rpm NEMA motors and six spindle speeds in the standard speed range are provided. Table is actuated by power through a leadscrew and motor under remote control. Table surface is 20x120 in. Design enables hand feed, power feed, and tapping to be done—*The Avey Drilling Machine Co, Cincinnati 1, Ohio*

New Truck-Man Models

Two new models were designed to solve the problem of low load limits on elevator floors in the light-weight, low-cost, high lift field.

Both models are designed around the 360° rotating Truck-Man power turret. Model D-15 is a counter-weighted high lift having a capacity of 1500 lb while the truck itself weighs only 1700 lb. Standard model has 84-in. lift with 15-in. load centers. Model DS-20 has balance maintained by stabilizing outriggers which project forward on each side of the load. With a load capacity of 2000 lb, the weight of this model is only 1300 lb.

Power is provided on either truck by aircooled engine which reportedly will operate a full 8-hr shift on 1 gal. of gas. Other features include pneumatic tires on drive wheels, rubber tired load wheels, and 360° steering.

Truck-Man Div, The Knickerbocker Co, Jackson, Mich

Surface-Angle Plate Of Black Granite

Rahn Granite Surface Plate Co has developed a surface-angle plate combination constructed of black granite (diabase). Pictured is a 24x36x6-in. plate with two 8x24-in. plates attached to one edge. All three plates have been finished to a tolerance for flatness of 0.00005 in. One 6x36-in. edge of the 24x36-in. plate has been finished square to the top surface, so when 8x24-in. plates are attached, they will lie within 0.0001 in. of a plane 90° to the plane of the surface plate.

Rahn Granite Surface Plate Co, 641 N Western Ave, Dayton 7, Ohio

Firth Metals and Alloys For High-Temperature Uses

Chromium carbides developed by Firth Sterling are said to have high resistance to oxidation at elevated temperatures, lower weight, and higher coefficient of expansion to other carbides. The compounds, formed by the reaction of chromic oxide or chromium metal with carbon, are used as gage blocks, and have many potential applications.

Firth heavy metal, now being produced in large quantities, has from 17.5 to 18.2 spg, more than twice as heavy as steel and over 50% heavier than lead. Alloy can be easily machined with high-speed steel tools. Tensile strength is around 40,000 psi, which may be increased up to threefold if a lower specific gravity can be tolerated; compressive strength is over 400,000 psi. Product can be supplied up to 20 in. dia by 18 in. high, or in equivalent volumes weighing up to 3500 lb.

High-temperature materials being manufactured by the company include Cermets, particularly applicable to problems encountered in developing and improving efficiencies of jet engines; such specialized new materials for high temperature applications as Discaloy, 16-25-6, A286, 19-9-DX-DL, and the rolling and forging of Zirconium.

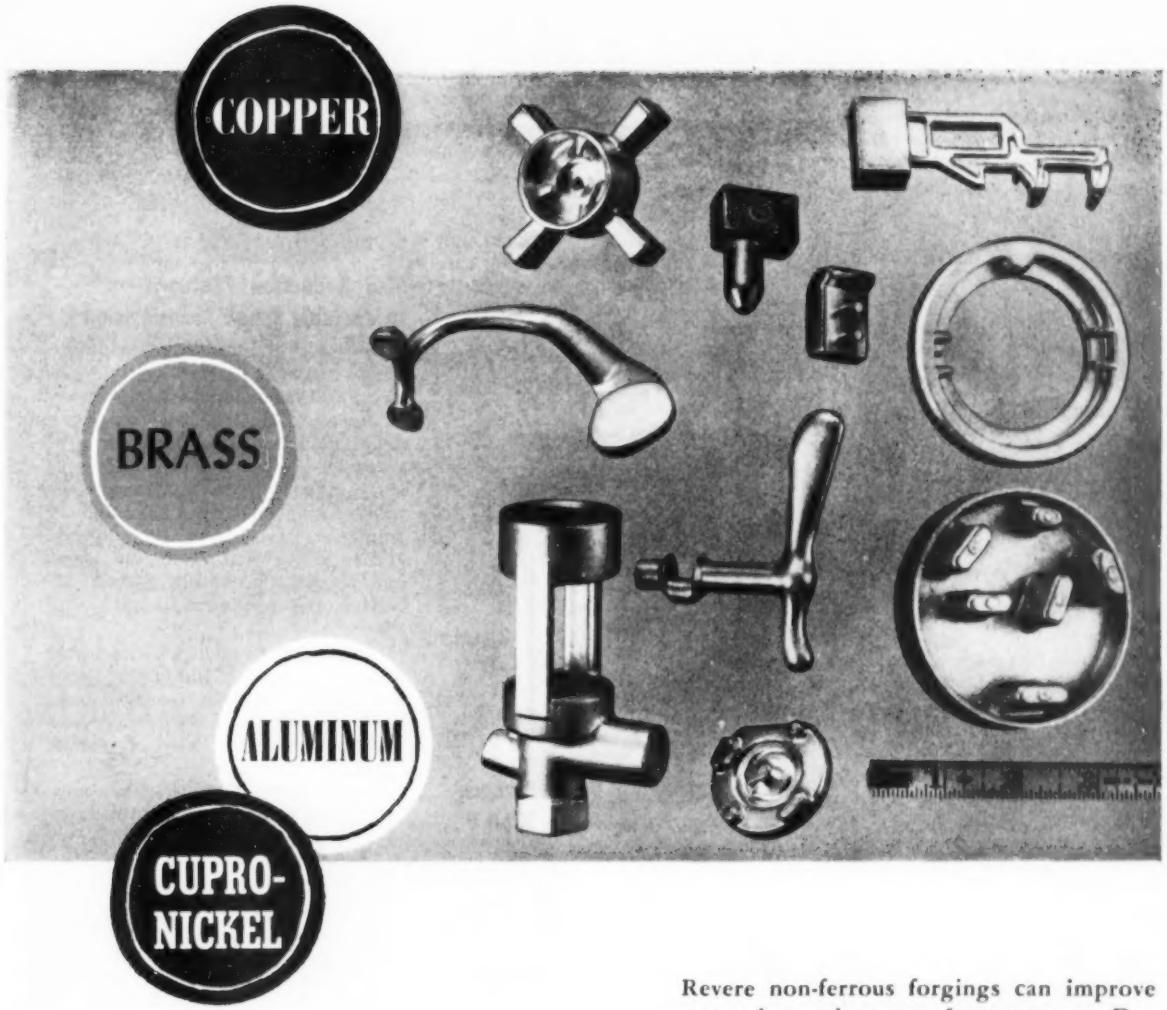
Firth Sterling, 3113 Forbes St, Pittsburgh 30, Pa

Zagar Drill Jigs Are Self-Clamping

Zagar has designed and standardized a line of self-clamping drill jigs to be used in conjunction with Zagar gearless, multiple-spindle drill heads. Jigs can be used with drill heads to perform drilling, reaming, and tapping on standard drillpresses and tapping machines. Four types handle hole patterns from 3 to 15 in. in diameter.

Self-clamping is accomplished by downward stroke of drillpress spindle exerting force on the drill head which transmits the force to the bushing plate. The bushing plate locates the workpiece which is then firmly clamped by springs between bushing plate and drill head.

Zagar Tool, Inc, 24000 Lakeland Blvd, Cleveland 23, Ohio



Revere non-ferrous forgings can improve your product and cut manufacturing costs. Due to high strength-weight ratios, weight reduction often is possible. Complex parts now assembled in several pieces may be forged in one piece. Dimensions are accurate, reducing machining time, scrap, rejects. Surfaces are good; small details such as names, trademarks and numbers can be held sharp. Being uniform in density and free from blow-holes, Revere Forgings are non-porous and will hold fluids and gases without leakage. It will pay you to get all the facts about forgings. See the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N.Y. Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

Drill Adjustable From 2 to 4 in.

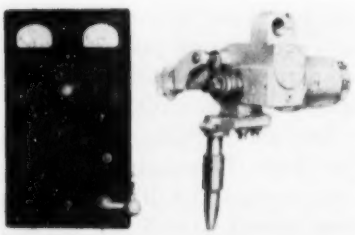
Hayden has designed a drill adjustable from 2 to 3 in. with one set of blades and from 3 to 4 in. with a second set. A scroll ring engaging bottom sides of blades performs double function of adjusting blades and supporting them against thrust of cut.

Body of drill is made of heat-treated alloy steel and blades are made of HSS. Carbide-tipped drills are also available.

Drill reportedly finds greatest value when used on drillpresses and radials where its balanced cuts work ideally with normal spindle construction. Blades are said to be easily modified to produce round corners, flat bottoms, angular surfaces, and steps.

Price of drill with two sets of HSS blades, wrench, and adjusting pin, is $160.00.

Hayden Twist Drill Co, 8626 Lyndon Ave, Detroit 21, Mich



Improved Model of Automatic Welding Head

Model 944 automatic welding head offers automatic control of both welding head and positioner as well as high frequency pilot circuit if one is used.

Electro-mechanical control circuit is designed to stop both head and positioner automatically if arc is broken or electrode sticks to work.

Feed rolls on welding head are hardened steel and adjustable for both solid and tube wire and accommodate any rod size from ⅛ to ¼ in. in diameter. Hold-down roll has integral tension arm eliminating springs.

Simplified control unit provides manual inching control, welding voltage control, travel control for positioner, and welding current control if transformer is equipped for remote control. Max current capacity is 2000 amp.

Mir-O-Col Alloy Co, 312 North Ave 21, Los Angeles 31, Calif

Recirculating Air Draw Furnace Has Range From 300 to 1350 F

Automatic recirculating air draw furnace features: door which automatically self-locks at any position; automatic air shut-off to prevent burns; guided airflow by rear-wall-mounted impeller; power selector switch to automatically regulate power input in proportion to temperature; radiant-heat shielding; and Modella heater bank of low-watt-density design.

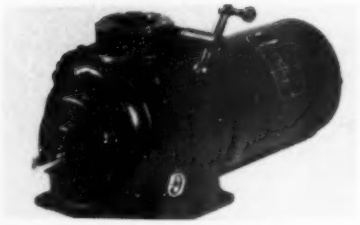
Inner chamber is constructed of stainless steel alloy; outer housing is of heavy gage reinforced steel and angle iron. All electrical devices are UL approved.

Inside dimensions of two standard models are: 12x24x12 (wxdxh); and 15x24x18 in.

Blue M Electric Co, 306 W 69th St, Chicago 21, Ill

Chucking reamers in new sizes have been added to Whitman & Barnes regular line of straight shank flute and straight shank spiral flute tools. Straight flutes available in fractional sizes of all 64ths, from 3 through 31 64 in. and decimal sizes of a thousandth of an inch on each side; wire gage sizes, No. 1 to No. 60; letter sizes A to Z. Spiral flutes furnished in all 64th sizes from 5 through 31 64th in.

Whitman & Barnes, Plymouth, Mich



Size Reduction Featured In Variable Speed Transmission

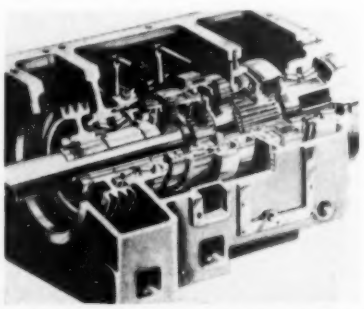
Model 28 Graham infinitely variable speed drive is an improved 1/6 to ¼-hp unit producing 50% more power in approximately the same size as previous design. Redesign provides for greater linearity and cooler, quieter operation. Improved power and performance are achieved primarily by sloping the tapered rollers downward from the input end, thereby providing greater effective roller dimension in same space.

Speeds may be changed with transmission running or stationary. Drive incorporates built-in overload protection that protects both itself and driven machine in event of jam or excessive overload.

Transmission is furnished as standard with micrometer control permitting easy adjustment to or between the 400 graduations. Compensation is provided for backlash.

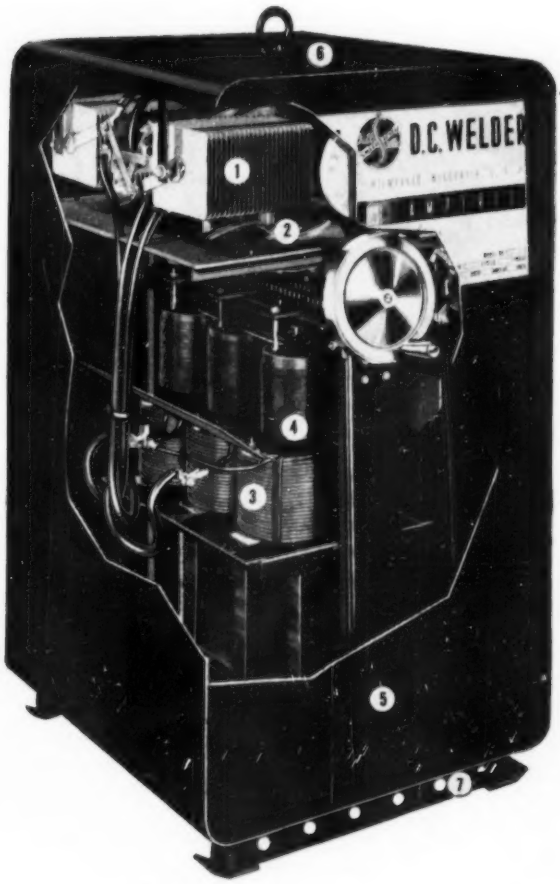
Model 28 is available with a wide variety of built-in reducer or step-up gearboxes including single- and double-reduction helical spur reducers and right-angle worm gear units with output shaft horizontal or vertical.

Graham Transmissions Inc, Menomonee Falls, Wis



HEADSTOCK OF MOREY NO. 5 TURRET LATHE showing center gears, planet pinion gears, internal gears, hydraulic cylinders, clutches, and brakes. By this planetary gear, hydraulically actuated drive control of headstock is reduced to pushbutton operation. Capacity is 2½x12 in., bar; chucking, 15-in. dia — *Morey Machinery Co, Inc, 410 Broome St, New York 13, NY*

First year's savings can repay your investment in A. O. Smith D.C. Rectifier welders that replace motor-generator sets. **44% more efficient** in operation than heavy rotary equipment! **End costly maintenance** . . . add the benefits of better, smoother, faster welding at much less cost.



A.O.Smith

D. C. RECTIFIER WELDER

1. Rectifier stacks are cooled by fresh air drawn in at the top by **2.** Life-time industrial fan, which then blasts air down over **3.** Heavy copper, fibrous glass-insulated transformer coils. **4.** Primary coils move up or down for current setting on ball-bearing jacks under stepless, non-creep current control. An illuminated scale is easy to read. All parts are easily accessible for maintenance by removing a few screws and a panel of the **5.** Attractive, restful-green, baked-on enameled steel case. **6.** Eye-bolt for hoist and **7.** Floor clearance for handling with fork-truck makes the A. O. Smith Rectifier portable.

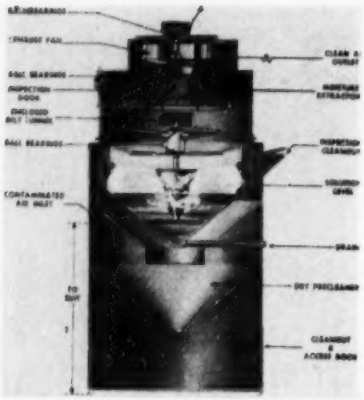
Made by welders . . . for welders

Write Dept. AM -1153 for complete details

A.O.Smith CORPORATION

Welding Products Division, Milwaukee 1, Wisconsin

International Division: Milwaukee 1, Wisconsin



Dust and Fume Eliminator

Centri-Merge vertical rotor wet-type dust and fume eliminators are made in two types. One unit is used for wet collection and elimination only, while the other is a combination primary dry and secondary wet collection unit. Latter has built-in dry-type pre-cleaner for dry collection of heavier particles and is useful where material salvage is an operational requirement.

Both units combine cyclonic principle of dust separation and positive high-pressure water action to remove impurities from air in rotating torrent of water. Capacities range from 500 to 50,000 cfm.

Advantages claimed are: low ratio of power to rated capacity; high ratio of water circulated to air volume handled; independently driven rotor and fan to permit adjustments to meet load and operating conditions; automatic liquid-level control; self-acting skim-off of floating particles collected in the tank; collection and elimination functions not affected by water failure; and optional location of air inlet arm.

Schmieg Industries, Inc, Box 4701, Detroit 34, Mich

Measures Roughness In Small, Deep Holes

Six Profilometer LE-type tracers take surface-roughness measurements in holes as small as ½ in., as deep as 24 in., and from 1 to 75 microinches roughness.

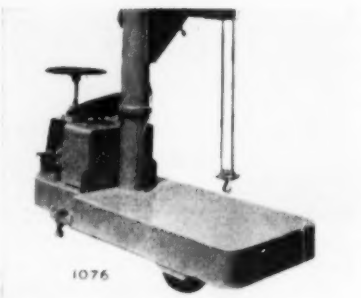
Tracers have integral Linkarm, each available in three standard lengths for measuring to maximum depths of 9, 18, and 24 in. Tracers with Linkarms are intended for operation by Mototrace, but can be used for hand tracing. Tracers with Stiffarm are for manual operation. All tracers can be used with any Profilometer Amplimeter.

Micrometrical Manufacturing Co, 345 S Main St, Ann Arbor, Mich

Welding Benches

Series of welding benches with a 36½-in.-sq top has been introduced. Firebricks can easily be installed on top of the standard height unit which is equipped with a bench drawer and shelf with partitions for holding welding rods. Bench needs neither end nor wall support.

Industrial Equipment Bench & Mfg Co, 98 South St, New Britain, Conn



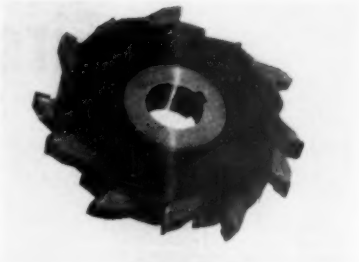
Revolving Crane Truck Added to Loadmobile Line

Revolving crane truck, developed for use in removing molds from rubber tire molding machines, can be used for handling other molds and for miscellaneous maintenance work. Capacity is 2000 lb and height is 68 in. The hook, 60 in. high when raised and 10 in. high when lowered, projects 24 in. over either side of the truck and is raised and lowered by power.

Power operation is furnished by separate pump and motor which pumps fluid into a double-acting ram inside the main mast. A double-acting ram is used so that hook, whether loaded or empty, will lower at safe speed and will not depend on gravity. Boom has complete angular travel of better than 180°.

Body for truck is standard Loadmobile freight truck. Loaded speed is 2½ to 3 mph, non-loaded, 3 to 3½ mph.

Materials Handling Division, Market Forge Co, Everett, Mass



Milling Cutter Line Uses Two Blade Sizes

Millit has added extended-width slotting cutters to its standard milling cutter line. Stagger-tooth method of mounting replaceable blades allows manufacturer to make any width cutter desired.

"A"-size blades are used for cutters from ½ to ¾ in. wide; "B" for larger. Use of two blades simplifies stocking problems.

Stagger-tooth method of mounting across width of cutter body avoids use of long lengths of carbide and inherent brazing strains. Cutter can also be used for heavy side milling where increased cutter width is desirable.

Extended-width cutters now available range from 4 to 14 in. and can be made up to cut any width over ½ in. Replaceable blades are available with HSS, cast alloy, or carbide tips.

Millit, Inc, 55 Flint St, Rochester 8, NY

Magnetic Base Indicator Holders

Miti-Mite indicator holders, with attachments, hold nearly all dial indicators. Swivel-action post is secured in position with knurled locknut. Sensitive friction joint gives accurate adjustments.

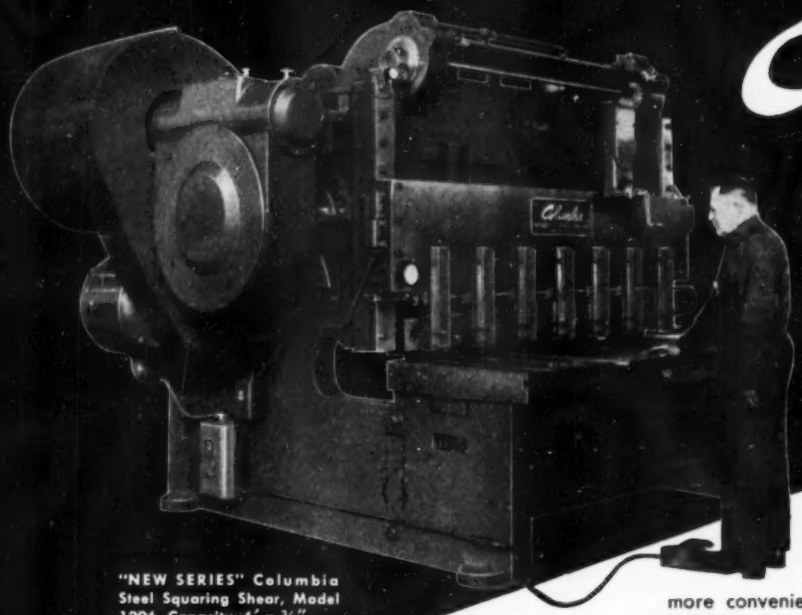
Three models are available: No. 100 provides 50-lb pull and sells for $8.00, including attachments; No. 101 is same but has extra-fine adjustment feature and sells for $9.50; No. 150 has permanent magnet providing 100-lb pull and price is $16.50.

Lufkin Rule Co, Saginaw, Mich

5315

MAKE NO MISTAKE about it

Columbia builds BETTER shears!



"NEW SERIES" Columbia Steel Squaring Shear, Model 1206. Capacity: 6' x ¾".

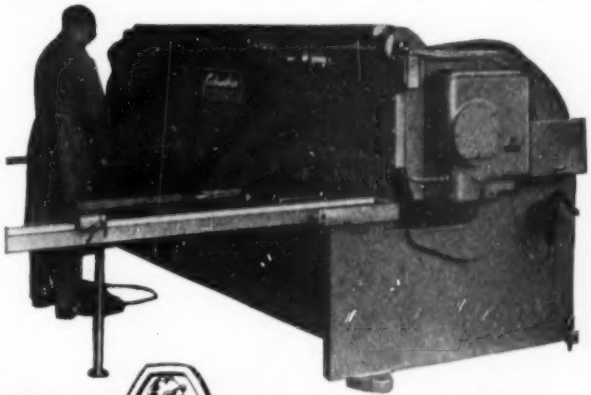
"NEW SERIES" Columbia SHEARS are more convenient in operation, more accurate and safer; incorporate more stamina, have a greater production potential. Consider that fact; and its implied benefits of longer tool life, easier maintenance, fewer repairs, more production, less scrap, fewer accidents!

AS A QUICK EXAMPLE of Columbia's better design take a look at the Columbia exclusive air clutch.

- ★ It reduces gear wear by as much as 75% through elimination of gear movement except in actual cutting cycle.
- ★ Application of power is soft. Shocks are not transmitted.
- ★ Inherent clutch slippage at overload point acts as automatic cut-off.

AND THE DESIGN IS RICH with parallel advantages. Such as the exclusive hydraulic holddown finger connections which contribute so much to the ease of holddown system maintenance; the special slitting provision which extends the capacity of the bed; the blade clearance setting gage, which makes blade clearance setting an "operator function."

Other capacities from 6' x 3/16" to 6' x 1¼", 12' x 1", 14' x ¾", or 20' x 3/8" in mild steel.



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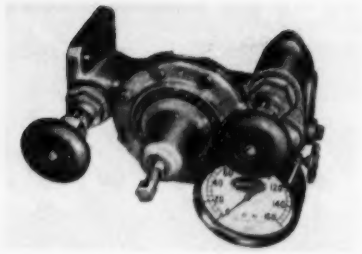
new series **Columbia** STEEL SQUARING SHEARS and POWER PRESS BRAKES



Air Control Manifold Valve Works in Reduced Space

One compact unit contains pressure regulator, accessory valves, pressure gage, and fittings normally required to control pressure in an air line. Unit consists of globe shut-off valve, a pressure gage protected from line fluctuations by needle valve, check valve, and globe exhaust valve. Entire assembly measures 10 in. from inlet to outlet.

Special headers are used when more than one manifold is required. Headers are available in 2-, 4-, 6-, and 8-station units.

Danly Machine Specialties, Inc, 2100 S Laramie Ave, Chicago 50, Ill

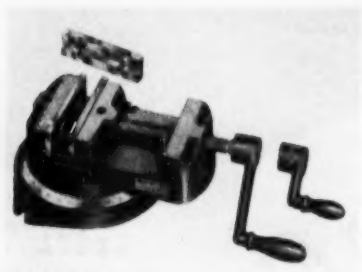
Precision-Built Milling Vises

Kenco 6-in. milling vise possesses the same construction features as the standard 4-in. model. Swivel base is graduated at 45° to operator for easy reading. Graduations run from 0 to 90 to 0°. Markers are located right and left. Movable jaw is secured by slide plate which can be locked solid after work is clamped in position.

Body is made by sobrocast process. Standard equipment includes three hard-face jaw plates. One is milled with V-blocks for round work, both horizontal and vertical; the other two jaws are for conventional work. Each comes with two handles: short handle for fast travel; long handle for locking the work.

Jaw opening is 4½ in., height 4¾ in., weight 55 lb.

Kenco Manufacturing Co, 5211 Telegraph Rd, Los Angeles 22, Calif



Specialty Metal Strip Available in Wide Variety

Close tolerance metals, thin gages and foils, clad metals, are available from American Silver Co in widths up to 8 in., in thicknesses down to 0.0005 in., held to tolerances as close as ± 0.0001-in. In addition to standard strip metal items, such as beryllium copper alloys, stainless steels, carbon steels, nickel base alloys, the company's coil stock includes titanium, tantalum, zirconium, Invar. A new line of thermostatic bi-metals is also available.

Silver brazing material has been developed by which even the most complicated metal parts can be bonded together without dependence upon skill and judgment of the operator, according to the manufacturers.

American Silver Co, 36-07 Prince St, Flushing 54, NY

Testing Machine Locates Leaks in Castings

Hautau vertical pressure testing machines detect leaks in castings as well as brazed, welded, and soldered assemblies. Machines are air-operated and electrically controlled and subject parts to a 10-sec automatic check during which part is charged with given volume of air. Loss of air pressure is indicated by signal lights actuated by sensitive measuring system.

Machine illustrated tests rifle grenade assembly leaks. Four test stations are provided. Unit mounting of the measuring system components for each station permits machine to continue functioning regardless of conditions at an individual station. Pushbutton controls are located so minimum hand motion is required to load machine and control test cycle.

Tester operates on an 80-psi air source and 110-v line.

Hautau Engineering Co, 721 Wanda, Ferndale 20, Mich

Vandy Height Gage

Height gage reads directly to hundredths on barrel and thousandths on dial. Range is 0 to 2 in. plus gages inserted between surface plate and base. All wearing parts, except bearing bronze split take-up nut, are of hardened Swedish steel electrolized for long wear. Knob is knurled for easy adjustment. Screw is a ⅜ – 20 precision ground unit, spring loaded.

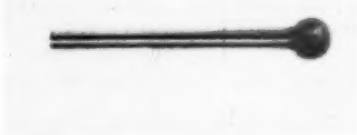
Electrolizing Sales & Tools, Inc, 1406 E 15th St, Los Angeles 21, Calif

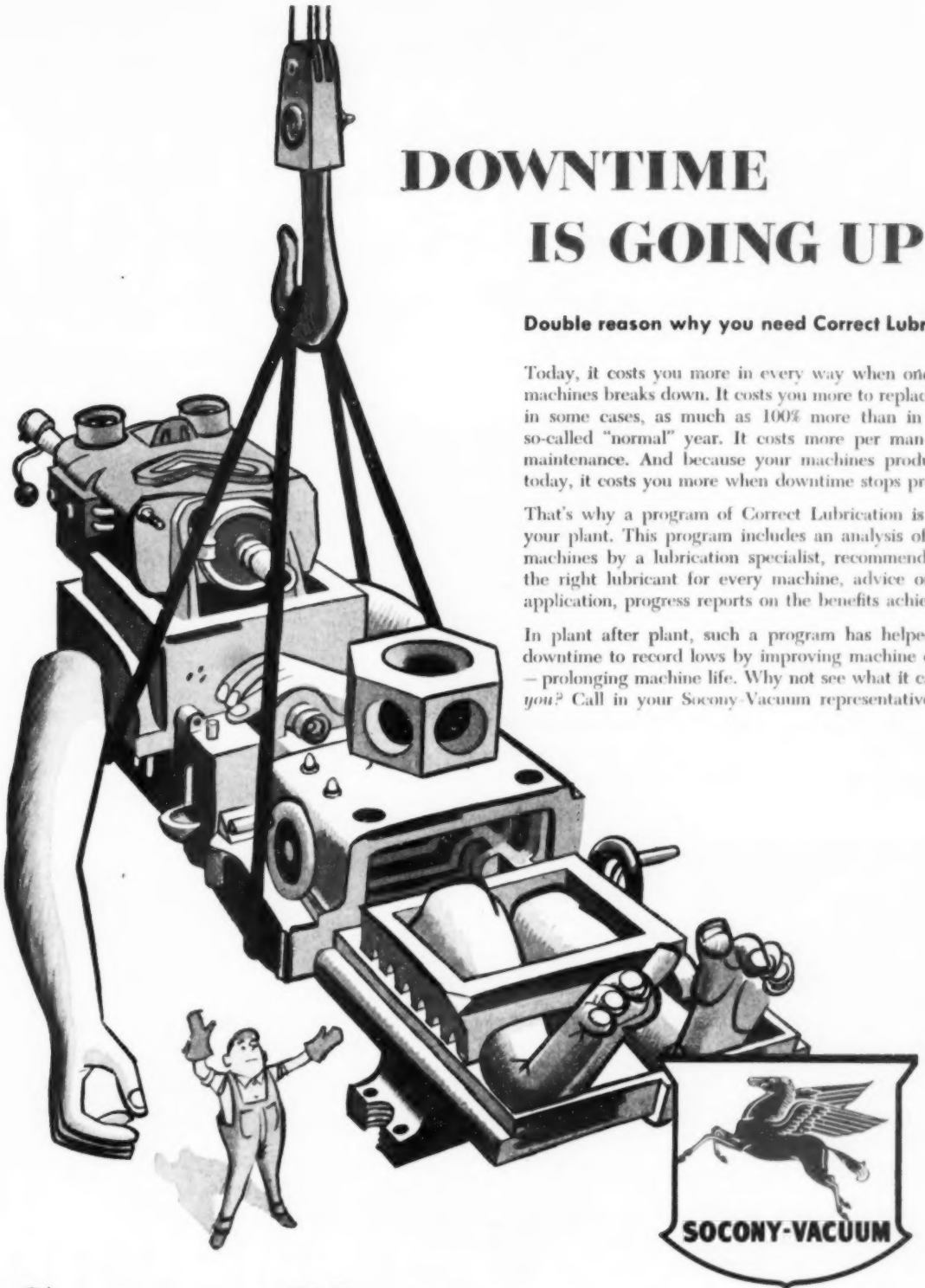
Modern Toolmaker's Ball Speeds Measurement, Layout

A method of producing toolmaker's balls with an accuracy of ±0.0002 in. has been developed by Douglas Aircraft and the balls are being produced by Flabob, Inc. The device consists of a straight shank with the ball welded onto the end. Shank portion is inserted in hole drilled at intersection of station lines during construction of machine jigs and fixtures. Direct measurement can be made on a line perpendicular to the ball tangent. Ball is available in ½-in. diameter.

An accessory socket-type unit has been designed to clamp onto the end of a precision steel rule. Socket portion fits snugly against the periphery of the ball and establishes an exact inch between the center of the ball and the end of the rule.

Flabob, Inc, 1301 W 1st St, Los Angeles, Calif





DOWNTIME IS GOING UP!

Double reason why you need Correct Lubrication!

Today, it costs you more in every way when one of your machines breaks down. It costs you more to replace parts — in some cases, as much as 100% more than in the last, so-called "normal" year. It costs more per man-hour for maintenance. And because your machines produce more today, it costs you more when downtime stops production.

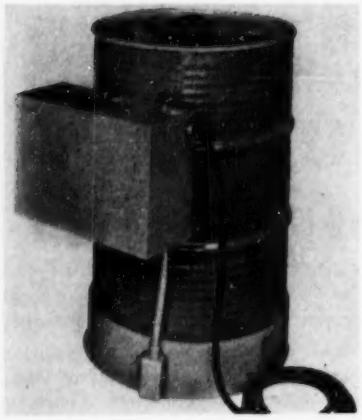
That's why a program of Correct Lubrication is vital for your plant. This program includes an analysis of all your machines by a lubrication specialist, recommendations of the right lubricant for every machine, advice on correct application, progress reports on the benefits achieved.

In plant after plant, such a program has helped reduce downtime to record lows by improving machine efficiency — prolonging machine life. Why not see what it can do for *you*? Call in your Socony-Vacuum representative!

Socony-Vacuum *Correct Lubrication*

First Step in Cutting Costs

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



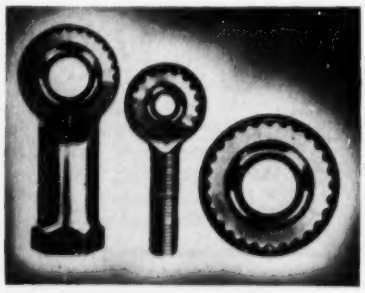
Baronet Vapor Degreaser Claimed Economical

Parts cleaning is accomplished automatically in non-flammable trichlorethylene vapors. Greasy parts are lowered into the vapor zone and thorough cleaning is said to be effected in less than a minute.

Degreaser requires only 5 gal. of cleaning solvent for effective operation. Reclaiming the dirty solvent is accomplished automatically by an air-cooled condenser which also controls the vapor height.

Working area is 23 in. in diameter and vapor depth is 18 in.

Baron Industries, 241 W Avenue 26, Los Angeles 31, Calif



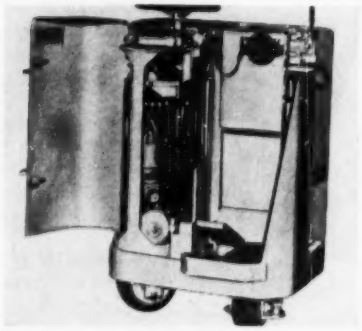
Spherical Bearings Feature Adjustable Ball Race

Lincoln Park line of spherical and spherical rod end bearings includes variety of sizes and types. Means is provided for adjusting the ball race for accurate positioning of the bearing.

Each bearing race insert is designed so that it may be adjusted to any degree of relationship to the ball. By using a spanner wrench inserted in notches on outer edge, race can be tightened or loosened—one notch adjustment is slightly less than 0.001 in. Once the adjustment has been made, bearing race inserts are firmly locked in position by means of a setscrew inserted through the notch which is at the bottom position.

Inserts are made of Mueller 600 bronze and ball is made of SAE 52-100 steel, hardened and chrome plated. Bearings are pre-lubricated. Lubrication is supplied through the stem in rod end bearings and through lubrication holes in the spherical bearings. An opening between the two bearing race inserts acts as a reservoir to provide an adequate supply of lubricant at all times.

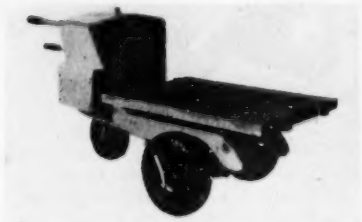
Lincoln Park Industries, Inc, 1719 Ferris Ave, Lincoln Park 25, Mich



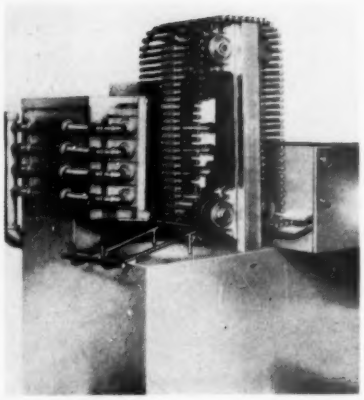
Power Unit Designed to Save Servicing Time

All moving parts on new Raymond power unit are housed behind hinged double doors as unit was specially designed to save time in servicing. All brushes on the unit are visible. Addition of foot extension provides more room for operator's feet. Steering wheel and controls operate entirely within confines of unit. Travel switch affords three separate speeds in both forward and reverse. Elevating control is located on travel switch, enabling forks to be raised en route.

The Raymond Corp, Greene, NY



ELECTRIC-STARTING POWERED WHEELBARROW with ¾-ton capacity is 32 in. wide. Two sizes of flatbed platforms are interchangeable with the 10-cu-ft bucket for moving heavy maintenance items—*The Prime-Mover Co, Muscatine, Iowa*

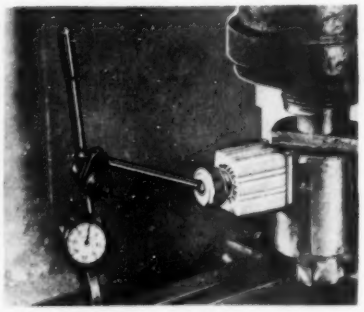


End Heating Unit Speeds Production

G. A. S. heating unit heats section lengths up to 4 in. of pieces with overall length varying from 6 to 24 in. Unit is said to be ideally suited for such rod end heating operations as upsetting, bolt heading, swaging, and localized hardening.

Reported production figures on heating a 4-in. end section of a ½-in. rod show 50 sec for bringing part to 1900 F and a rate of 900 rods per hr; 75 sec for ¾-in. rod with rate of 600 rods per hr. Stock sizes from ¼ to 1½ in. in dia can be handled. Unit incorporates conveyor and automatic hopper feed.

Gas Appliance Service, Inc, 1211 Webster St, Chicago 14, Ill

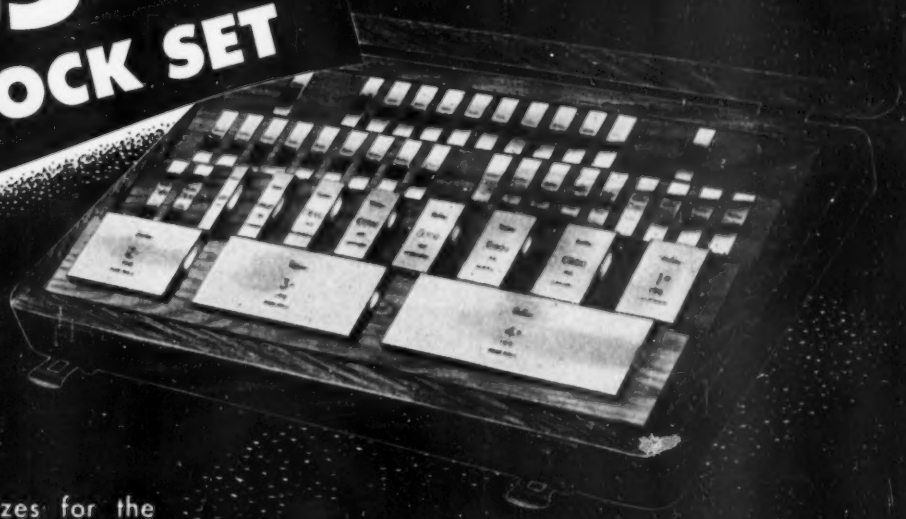


Dial Indicator Holder Has Magnetic Base

Indicator holder mounts to round surfaces as small as ¾ in. in diameter with a pull of 65 lb. Construction includes steel parallel ribs 1 7/16x¼x¼ in., ball swivel of brass and stem of non-magnetic material, three-step universal rod 6 in. long, swivel adapter allowing 360° swing in all directions, and adapter for attaching 5/32-in. stud type indicators.

Enco Manufacturing Co, 4520 W Fullerton Ave, Chicago 39, Ill

Accuracy ± .000008"
$165.00
43 BLOCK SET



Specially selected sizes for the small shop or a standby set where additional blocks are a needed convenience.

Keep a second set with wanted sizes available on instant notice. Avoids delay or even error that might result from using substitute gaging methods.

The 43 Block Set (43 B) has accuracy of ± .000008" and must pass the same test for surface finish, flatness and parallelism of the finest grade of steel blocks.

STANDARD GAGE BLOCK ACCESSORIES

If you use gage blocks you'll want the time saving convenience of this accessory set. It simplifies gaging by enabling you to apply the blocks directly to the work as a snap and plug gage, height gage, scriber and trammell. The set includes 4 gage block holders, base, straight and round jaws, centerpoint and scriber.

$135.00

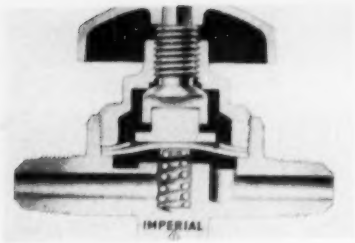
Complete with Case

Webber
GAGE BLOCKS and ACCESSORIES

WEBBER GAGE COMPANY
12901 Triskett Road • Cleveland 11, Ohio

Largest exclusive manufacturer of precision gage blocks

Send inquiries direct to Webber Gage Company



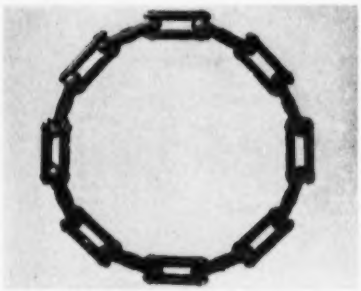
Valve Designed for Vacuum And Instrument Work

Imperial Brass packless shut-off valve, with solid Teflon diaphragm, is reported to be specially adapted to vacuum applications, instrument work, processing, and pneumatic service. Valve features soft seat to provide positive shut-off with easy fingertip operation.

Teflon diaphragm is chemically stable and resists all liquids and gases except fluorine, chlorine trifluoride, and molten alkali metals. Valve is recommended for pressures to 300 psi and holds ultra-high vacuum. Temperature range is –100 F to +450 F.

Unit is available with 45° flare or solder connections for tubing installations in size range from ¼- to ⅞-in. OD and in ⅜-, and ½-in. female pipe thread sizes.

The Imperial Brass Mfg Co, 1200 W Harrison St, Chicago 7, Ill



Star Line Conveyor Chain Uses Ball and Socket Joints

Conveyor chain 400, for heavy industrial use, reportedly reduces friction to a minimum and provides greater flexibility by use of ball and socket principle. Lugs on main links stabilize position of trolley, preventing binding or wedging on small vertical bends.

Chain is completely drop-forged. Line tests demonstrated it will pull over 60,000-lb ultimate load. Chain is assembled or disassembled without use of tools.

Arcturus Mfg Corp, 4301 Lincoln Blvd, Venice, Calif

Buda 7500-lb Capacity Fork Lift Trucks

Model FT75-24 (gasoline) and FTD75-25 (diesel) lift trucks are rated at 1500-lb capacity at a 24-in. load center from face of forks and are available with 72-, 84-, 108-, and 114-in. lift heights.

Truck design allows all side panels, as well as rear and top, to be easily removed. Incorporated is a 12-in.-dia industrial-type quick-change clutch which can reportedly be changed in 30 min.

Features include: Single-lever full-range gearshift; center-point automotive-type steering; full-front-vision instrument panel; hydraulic brakes; all-roller rolled steel mast; and self-aligning lift cylinder.

Overall length (less forks) is 100.5 in. with a wheelbase of 60 in. Width of truck is 42 in. Unit is designed to turn in a 77.25-in. intersecting aisle.

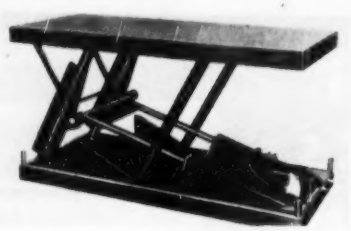
The Buda Co, Harvey, Ill

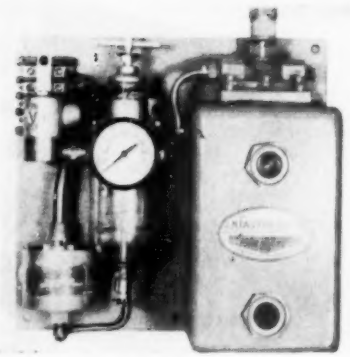
Hydraulic Lift Table Has 9-in. Minimum Height

Beacon lift table in lowered position measures 12½ in. from floor to top of table and can be made to achieve minimum height of 9 in. by displacing hydraulic pump unit to platform attached outside unit. Table can be raised to 43 in. and comes in standard 4000- and 10,000-lb capacity models. Size of units is 36x84 in.

Lifting and raising is accomplished by a Vickers full hydraulic power pack, with 1½ and 2 hp motors. Control is by pedals mounted at end of table. Remote control by a two-button station can be furnished.

Beacon Machinery, Inc, East St Louis, Ill



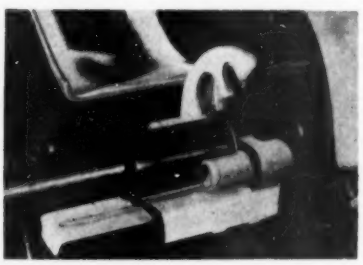


Automatic Oiling System

Fauver has designed an automatic oiling system for bearings, vees, slides, ways, rollers, cams, gears, and transmissions. Identified as Oil-Air, it has no moving parts but operates on compressed air. Oil is atomized and carried through tubing to parts.

Compressed air enters unit at 100 psi, passes through regulator, and pressure is dropped to 10 psi. As air passes through venturi, it draws oil from reservoir.

J N Fauver Co, Inc, 51 W Hancock, Detroit 1, Mich



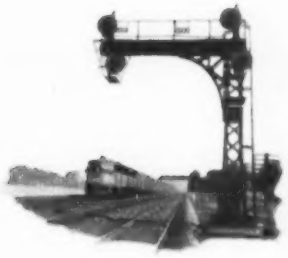
Extra-Capacity Pusher for Automatic Screw Machines

Larger stock can be handled on 1¼- and 1½-in. capacity B&S automatic screw machine by use of this extra-capacity pusher known as CAP-X. Pusher is provided with ball bearings and precision-made. No wear occurs on feed latch as all play takes place inside stock feed. Grip tension can be set to conform to weight of materials.

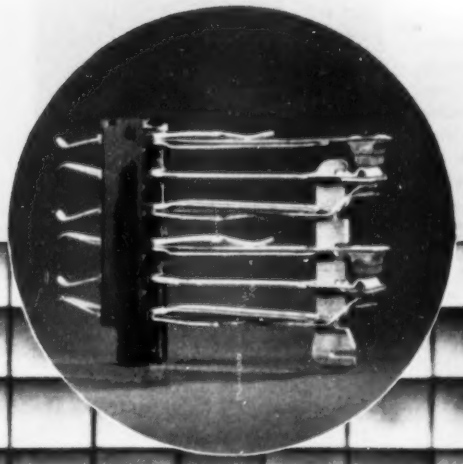
B&S No. 2G with device will handle outsizes of 1 9/16, 1⅝, and 1 11/16 in. using type 22D collets. Capacity for hexagonal stock may be increased to sizes 1 5/16, 1⅜, and 1 7/16 in. Capacity for square stock may be increased to sizes 1 1/16, 1⅛, and 1 3/16 in.

Kane Industries Co, 1732 N California St, Chicago 47, Ill

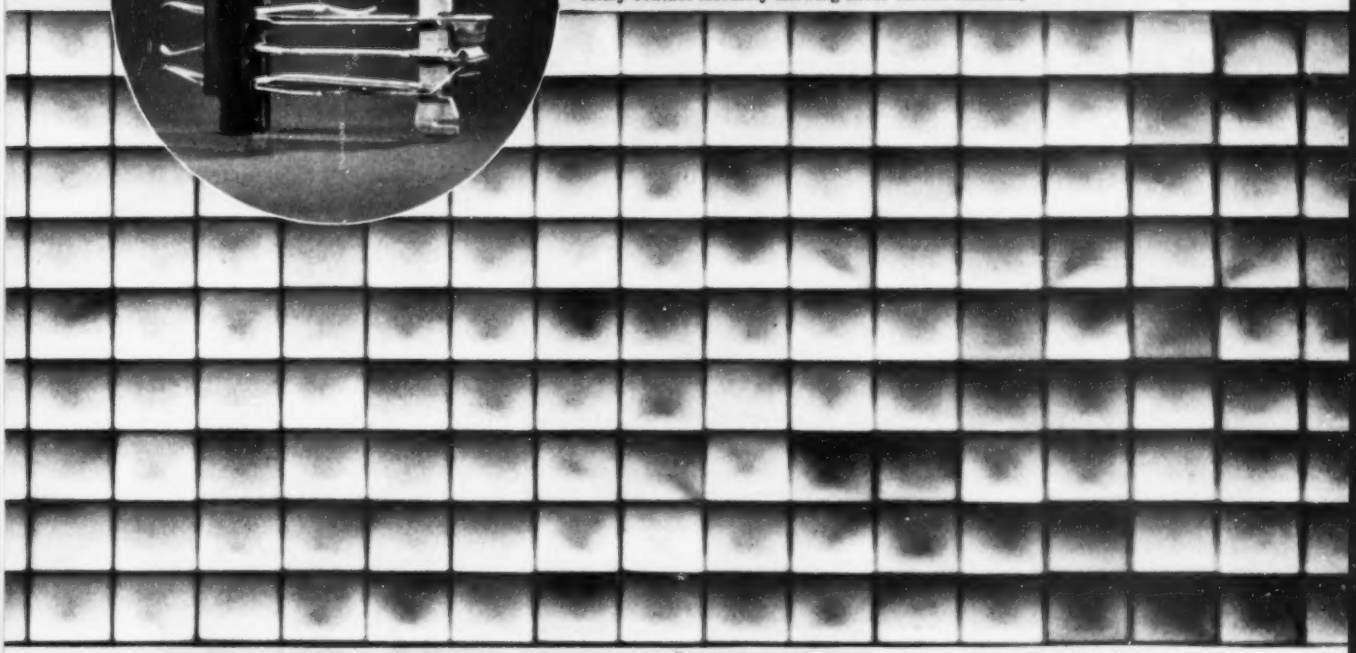
These relay contacts



spell train safety—



Relay contact assembly showing silver-carbon contacts.



Radiograph discloses contacts with improper silver dispersion.

RADIOGRAPHY gives them the "Green Light"

RELAY CONTACTS for railway signals must have low resistance. Ideally, this would call for silver touching silver—but pure silver contacts might fuse if overloaded and the signal lock on green. Carbon contacts can avoid this but have too high resistance.

The answer lies in impregnating carbon with silver, then making sure by radiography that the silver grains are properly dispersed throughout the carbon. This provides assurance that the relay will have a non-fusing contact with low resistance.

It's another example of how radiography can prove internal soundness, whether in such a compound as this, in a casting, or a weld.

Radiography is improving products and production in many kinds of operations. To learn how it can help you, see your x-ray dealer.

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...

another important function of photography

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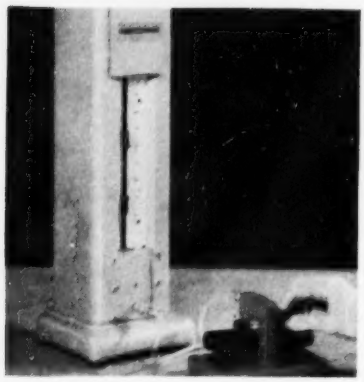


Air Gage Checks Cylindrical Parts

Sheffield gage was designed for accurate and rapid inspection of cylindrical parts, such as automotive piston pins. Two cylindrical steel guide rails on each side of air ring can be revolved when sliding surfaces are worn.

Operator lays the pin on the two steel cylindrical guide rails and pushes it through the air ring. Position of float in Precisionaire column indicates whether or not pin is within dimensional tolerance. Air ring has three open-type air jets spaced 120° apart. When connected to a Precisionaire having a 10,000 to 1 amplification, a variation in diameter of 0.0003 in. will cause the float to move 3 in. in the column.

Air ring gages are available with amplifications of 1000 to 1, 2000 to 1, 5000 to 1, and 10,000 to 1, depending upon part tolerance.

The Sheffield Corp, Dayton 1, Ohio

Only 4-in. Diameter for Permanent Magnet Pulley

Eriez 4-in.-dia permanent magnet pulley is claimed to test as strong as units twice its size. Design utilizes a peripheral magnetic field running completely around the pulley surface parallel and circumferentially to the shaft. Pulley is said to be ideal for conveying systems where belt thicknesses are ⅛ in. or less and speeds do not exceed 30 rpm. Unit is also suited for use as sheet steel separator or controlling roll.

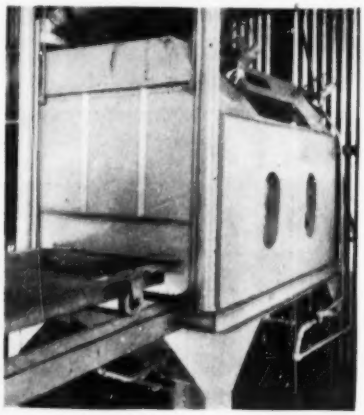
Pulley is built in belt widths of 4, 8, 10, 12, 14, 16, 18, 20, and 24 inches. All pulleys are furnished with heavy-non-magnetic, 1-in. stainless steel shafts. Pulleys themselves can be supplied in stainless steel.

Eriez Manufacturing Co, Erie, Pa

Wet-Blast Cabinet Uses No Pump

Belmont wet-blast cabinet removes surface contamination and polish with a slurry of fine abrasive. Complete agitation of slurry is provided with Whirlpool mixing device, eliminating need for agitating pump. Air ejector draws liquid from top surface and shoots it tangentially into mixing chamber, assuring complete agitation.

Belmont blast gun is said to throw more slurry at higher speeds than



conventional guns. Stronger suction is provided by annular air jet and slurry is pulled straight through gun without changing direction. Surrounding high-speed air accelerates slurry to higher speed through efficient long converging nozzle.

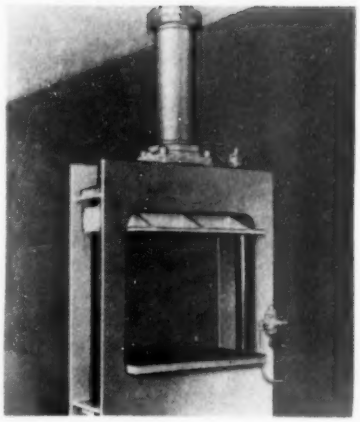
High-pressure centrifugal blower (700 cfm) pulls vapor from cabinet through filter. Water spray cleans filter and drains to separate sump.

Door-opening of 48x36x75-in. cabinet is 31-in. square. Abrasive ranges from 50 to 2000 mesh, non-metallic, used with dispersing agent and inhibitor.

Vacu-Blast Co, Inc, Belmont, Calif

SAF-I line of cup-type goggles includes a model for chippers and two types for welders. Chippers' goggle is equipped with plastic lenses said to be extremely scratch-resistant and strong, with only half the weight of safety glass. In addition to Optilite A lens, Optilite B plastic, and hardened glass are also available.

United States Safety Service Co, 1215 McGee, Kansas City 6, Mo

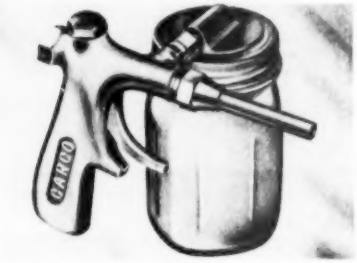


Compression Press by Sheridan-Gray

Compression press provides a 24x36-in. platen with 50-ton capacity and 30-in. stroke and has been designed for low cost. Economical frame design is said to give ample strength with no sacrifice in accuracy.

Presses can be operated singly or in multiple from a central pumping unit. Hydraulic power supply can be located in any convenient spot. Air hydraulic power units are also available.

Sheridan-Gray Inc, 405 Via Chico, Palos Verdes Estates, Calif



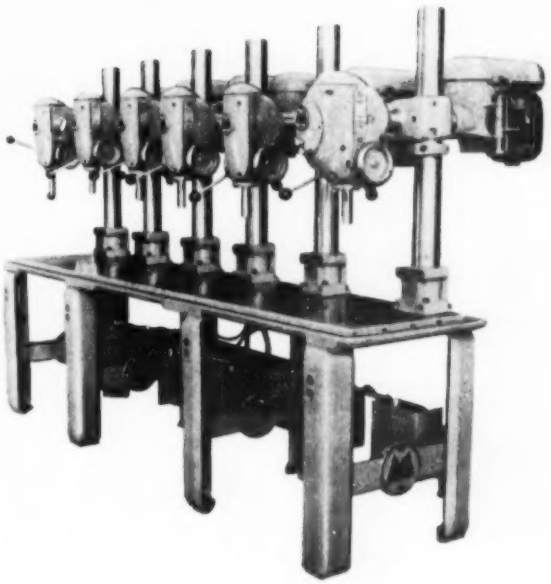
Triple-Purpose Blast And Cleaning Gun

Carco gun is a sand-blast, liquid-cleaning, and air-cleaning unit. It operates on air pressures of 75 lb and up; max efficiency for sand blasting is obtained with air pressures of 100 to 140 lb.

Gun has a light metal body and a precision-built valve and trigger assembly and is equipped with a hardened steel jet and nozzle. Complete kit contains gun, three extra hardened steel nozzles, extra hardened steel jet, glass sand container with cap, machined brass fittings, three-foot rubber hose, and convenient wrench.

C A Roesch & Co, 1221 South Hope St, Los Angeles 15, Calif

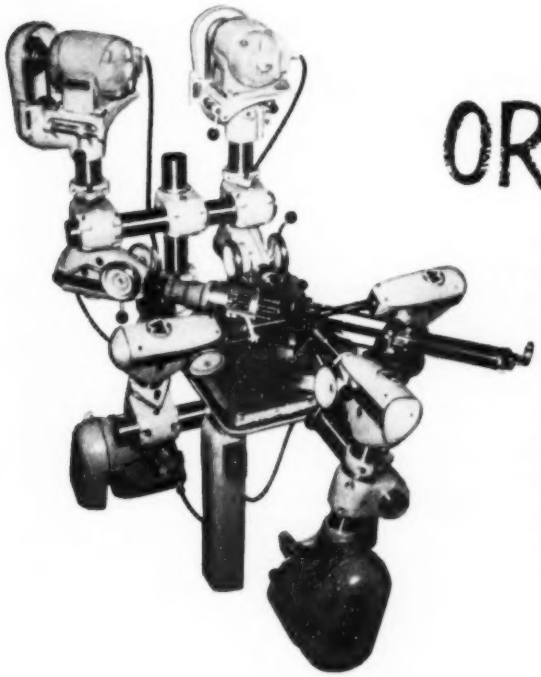
ONE AT A TIME



Used conventionally, MAGNA DRILL is one of the finest drill presses on the market.

With 1 h.p. motor, it drills 1" in cast iron, ¾" in steel, has a 5" stroke . . . adjustable throat drills to the center of 28" circle. Spindle speeds: 380 to 6860 r.p.m.

MAGNA DRILL drills, reams, counterbores, taps, countersinks, spotfaces and grinds. Package mechanical feed attaches in a few minutes to the drill head, feed rates .003" to .012" per r.p.m. Automatic cycling. Prices for MAGNA DRILL components are F.O.B. destination: drill head (less 1 h.p. motor), $285; column and base, $43; tables, $185 and $235; power feed, $195; lead screw tapper, $260; speed reducing quill, $160.



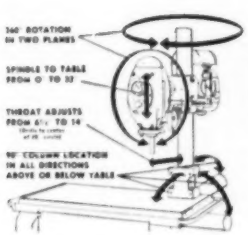
OR ALL TOGETHER

MAGNA DRILL can be set up quickly to drill or tap any number of holes in any number of planes, *all at one time.* Each head can have its own speed, feed, drilling angle. You can change setups *without special tooling* in a very short time; if necessary, *overnight!*

On the left, you see a MAGNA DRILL setup at a west coast plant. It has cut machining costs from $1.10 to $.16 per unit (high-pressure bronze valves), reduced number of rejects, and improved the quality of work! This company uses MAGNA DRILL for four operations: (1) drilling and tapping 4 holes; (2) core drilling and counterboring two holes; (3) facing and counterboring one hole; and, (4) pipe tapping one hole.

ONLY MAGNA DRILL DOES BOTH!

Wouldn't you like to learn more about MAGNA DRILL? Just fill out and mail the coupon. No obligation!


360° ROTATION IN TWO PLANES
SPINDLE TO TABLE FROM 0 TO 32
THROAT ADJUSTS FROM 6½" TO 14
90° COLUMN LOCATION IN ALL DIRECTIONS ABOVE OR BELOW TABLE

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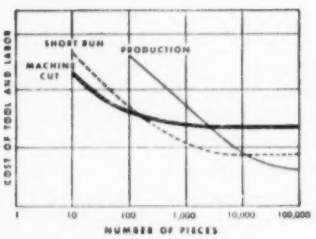
STAMPINGS

Our impartial use of three basic methods gives you economy regardless of length of run.

Most parts can be made by all three methods. But only **one** is **most** economical. The right decision is a technical one, based on **over-all** quantity, contour dimensions, tolerances and materials.

YOUR SUPPLIER SHOULD KNOW ALL THREE METHODS



This logarithmic chart shows the effect of these factors on the **specific part** illustrated. From 1 to 150 parts, our own **Machine-Cut Method** with no die cost whatsoever is most economical. At 150 parts, the **Short-Run Method** using economical blanking dies and stock punches is best. At 10,000 units, the standard **Production Method** with standard dies is most satisfactory.

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STAMPINGS DIVISION

LAMINATED SHIM COMPANY, INC.

3111 Union Street, Glenbrook, Conn.

Metile flooring is a wear-resistant surface consisting of steel plates of approximately 1 sq ft embedded in especially installed concrete. Numerous anchorage points secure plate to the concrete to prevent buckling or movement in either vertical or horizontal directions. Can be used over new or old concrete, sound wood bases, wood block or brick. Plates, so installed, are said to out-perform steel sheetings of thicknesses as great as ¾ of an inch.

Flash-Stone Co. 3723 Pulaski Ave, Philadelphia 40, Pa

Adjustable inspection mirrors, similar to dental mirrors, have been introduced to facilitate visual inspection behind gears, inside pipe angles, underneath fittings, and other difficult-to-see spots. Round models are available in 1½- and 2¼-in.-dia sizes; rectangular in 1⅜ x ⅛ in., and 2¼x3¼ in. Plastic handles vary from 9½ to 18½ in. Sleeve on handle permits easy adjustment within an arc of 45°.

F P Kretchmer, 3540 Dunn Drive, Los Angeles 34, Calif

Flash-O-Lens is a 7-power magnifier equipped with a Bausch & Lomb lens and a flashlight in the handle to illuminate the area it magnifies. The unit, designed for close-up inspection work, is priced at $14.85.

Abbeon Supply Co, 179-27R Jamaica Ave, Jamaica 32, NY

Line of precision cylindrical squares has been introduced, made of low carbon seamless steel tubing with ends welded in place. Units are carburized and hardened for extreme surface hardness and treated for stability; both ends are square with the body. Light weight makes for easier handling than with solid steel squares.

Reid Tool Supply Co, 332 W Delano Ave, Muskegon Heights, Mich

KWIKY masking disks for use in spray painting are available in diameters from ¼ to 4 in. by sixteenths. Removal of disks is facilitated by overlapping; a string may be removed from crepe paper liner in a connected strip for fast application to work requiring several of one size. Heat resistant material withstands oven baking temperatures up to 325 F for 30 minutes without leaving adhesive on the work.

By-Buk Co, 4311 W Pico Blvd, Los Angeles 19, Calif

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Defense production needs have put the spotlight on today's rapid technical developments—in machines, materials, processes, and management. New demands for know-how and skill face your personnel, from top engineering design down through the many levels of supervisory and mechanical shop work. Make sure you get the maximum efficiency and production from your whole staff—give them the advantages of the technical training and upgrading afforded by McGraw-Hill books.

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Presents the most pertinent and important facts relating to more than 8800 materials to enable eexcutives, purchasing agents, and engineers to make comparison, avoid checking many sources, and quickly get a working knowledge of the materials best suited for a particular purpose. Gives detailed information on chief characteristics, comparative data, sources, substitutes, adulterants, and uses for each material. Includes a section on economic geography of materials. **By George S. Brady, 7th Edition, 879 pages, $9.00**

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Coppersticks, a self-moulding packing compound for valves, pumps, and expansion joints, has dispersion of pure copper flakes throughout body of stick-shaped product. Designed for steam, hot water, or process air applications under vacuum or pressure, the material is soft, form stable, dry to touch. Available in 2-lb test cartons at $2.50 per lb, or regular 5-lb cartons.

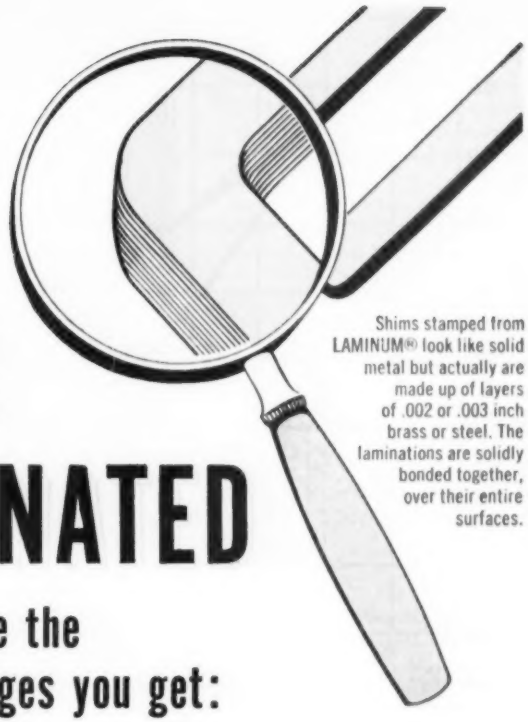
Surveys, Inc, 219 Euclid Ave, Trenton, NJ

Self-lubricating metal, said to have exceptional bearing strength, has been developed. New process employs both ferrous and non-ferrous metals, and specially formulated lubricative pigments locked together to create self-lubrication. Ratio of lubricative pigment to metal can be rigidly controlled with maximum lubricity to meet requirements of specific bearing pressures. Material may be used dry or with oil. Permanent lubrication for life of part is said to result because properties are constant throughout entire mass.

Booker-Cooper, Inc, 8487 Melrose Pl, Los Angeles 46, Calif

NAMES in the NEWS

Marvin S Bandoli, vice president of Proto Tools, Los Angeles, has been named to head consolidation of a number of divisions of the company and its subsidiaries. In his new capacity as vice president of sales, marketing, and distribution, Mr Bandoli will direct activities for Proto Tools; P & C Hand Forged Tool Co, Portland, Ore; Penens Corp, Schiller Park, Ill; and Proto Tools of Canada, Ltd, London, Ont. **Clifford A Faust** has been named director of merchandising, advertising and promotion for all divisions; **H W Oetjen,** manager of Proto domestic sales; **J H Perry,** vice president and sales manager of P & C Hand Forged Tool Co; **H H Hyler,** vice president and sales manager of the Penens Corp; **Manuel R Calvo,** manager in charge of Canadian and export sales for all divisions; **Nelson E Bartoo,** director of research and development for all divisions; **H D Norton,** director of contract sales.



Shims stamped from LAMINUM® look like solid metal but actually are made up of layers of .002 or .003 inch brass or steel. The laminations are solidly bonded together, over their entire surfaces.

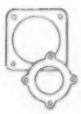
when a shim is

LAMINATED

here are the advantages you get:

REDUCED MACHINING COST:

You machine only to easy tolerances. The laminated shim is *adjustable*—you simply peel laminations of .002 inch brass or steel with a penknife—to get exactly the spacing you need. You cut costs without sacrificing quality.



SIMPLIFIED USE:

Shims come to you in one "pack" for each application. They are precision-stamped to your exact specifications. No counting, no stacking, no miking. Gauge is always known. No dirt or grit can lodge between layers.

SPEEDED PRODUCTION:

Final fitting can be done right at the job. You don't have to take parts back and forth for further machining, grinding or filing. No special skill required. The laminations adjust spacing quickly, easily.

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LAMINATED SHIM COMPANY, INC.

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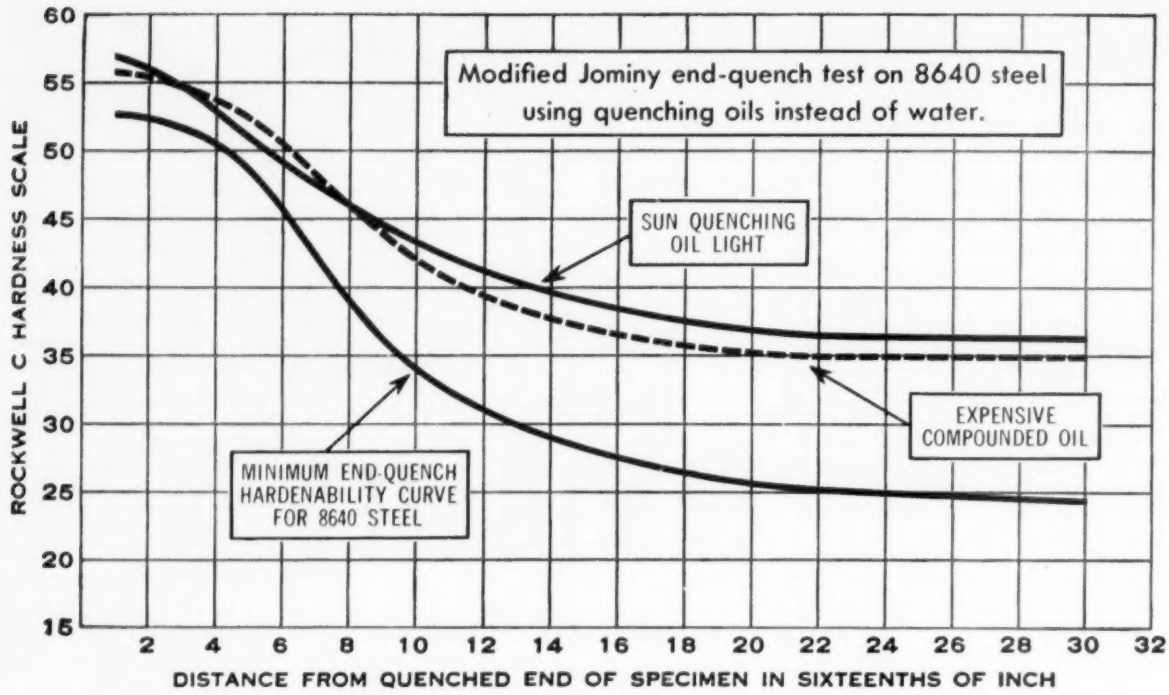

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This has been proved again and again in industrial heat treating departments and in the laboratory. The above test curves compare the results obtained from Sun Quenching Oil Light and those from an expensive compounded quenching oil. The hardnesses obtained are far above the commonly accepted minimum.

In addition to assuring consistently uniform physical characteristics, Sun Quenching Oils prevent sludge formation and help remove any deposits that may exist. Oil coolers are kept clean; maintenance costs are decreased. Sun Quenching Oils lower operating costs too. They thin out when heated, drain off parts faster and more completely. Make-up is materially reduced.

For more information about Sun Quenching Oils and how they can help you, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-11.

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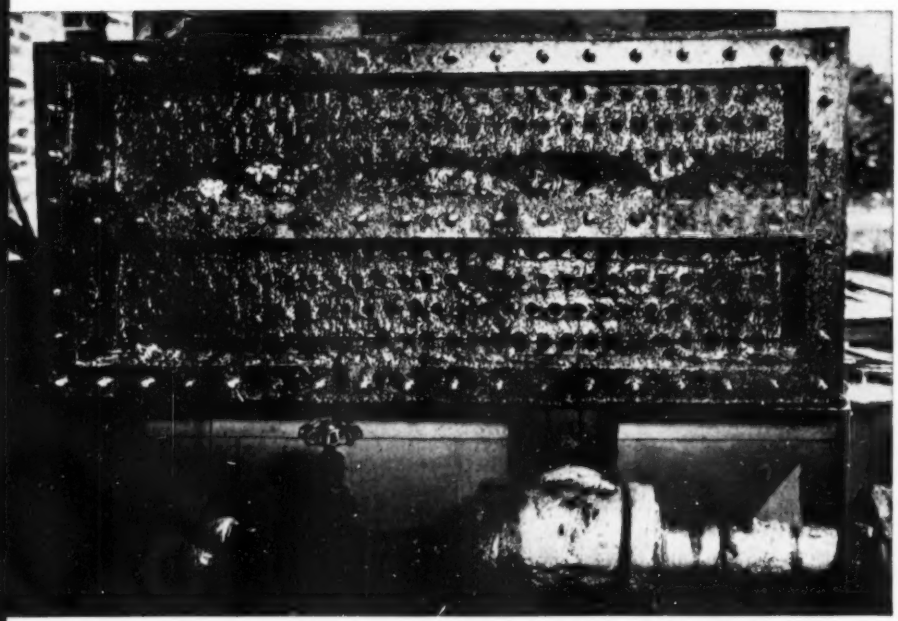
PHILADELPHIA 3, PA. ◆ SUN OIL COMPANY LTD., TORONTO & MONTREAL

THIS PLANT QUENCHES ALL TYPES and sizes of automotive and aircraft forgings. Sun Quenching Oil Light serves all five of the 2400-3000 gallon systems. In the seven years the shop has been using this oil, no unit has been down except for normal mill scale removal.



AN OIL THAT FORMS SLUDGE CLOGS oil coolers, increases maintenance and operating costs. Sun Quenching Oils have a natural detergency which helps keep the systems clean and removes any deposits that may exist.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO

PHILADELPHIA 3, PA. ◆ SUN OIL COMPANY LTD., TORONTO & MONTREAL

William H Barney has been appointed to the newly-created position of plant manager at the Toledo, Ohio works of Mather Spring Co Mr Barney was formerly associated with A O Smith Co, and with Delco Products Div, General Motors.

Dr James F Eversole has been named vice president in charge of research of Bakelite Co, a division of Union Carbide & Carbon Corp. Dr Eversole joined the organization in 1929; since 1951 he has been manager of research administration of Union Carbide in New York.

James L Woodley has been named to the new post of general service manager of Hyster Co. He was formerly production manager at the Danville, Ill, factory, and will make his new headquarters at the Portland, Ore, office.

Robert S Williams has been appointed assistant sales manager for the Industrial Filtration Co, Lebanon, Ind. He has been associated with Delpark Filter sales as a representative in the Pennsylvania, New Jersey, Delaware, Maryland, and Virginia area for the past year.

Hubert R Carlson has been appointed regional zone manager of the southern division of Rockwell Mfg Co's Delta Power Tool Div. Prior to joining Rockwell, Mr Carlson operated his own company, Carlson Saw & Equipment Co of Oklahoma City, Okla. He will make his new headquarters at the Atlanta, Ga, offices of the Meter & Valve Div.

Robert T Foreman of R A Jones & Co, Cincinnati, has been elected president of the Packaging Machinery Manufacturers Institute; he succeeds **Edwin H Schmitz** of Standard-Knapp, Portland, Conn. **Mrs Helen Horix Fairbanks**, president of Horix Mfg Co, Pittsburgh, and **Tom Miller**, vice president of Package Machinery Co, East Longmeadow, Mass, have been appointed vice presidents of the organization.

Rudolph F Gagg has joined the administrative staff of Raymond P Lansing, vice president and group executive of Bendix Aviation Corp, Teterboro, NJ. Mr Gagg, recently president of Air Associates, Inc, and previously assistant to the general manager of Wright Aeronautical Corp, Wood-Ridge, NJ, will assist Mr Lansing in the administration of seven Bendix divisions.

POWER CHUCKS

Famous cam and lever design of S-P Power Chucks holds the work tighter, withstands the high torque of heavy cuts with carbide tools at high speeds. Cam and lever design also resists opening of jaws by centrifugal force or diminishing air pressure...an important safety factor!

Installed as original equipment by Bardons & Oliver, Cleveland Automatic, Cone Automatic, Ex-Cell-O, Monarch, Warner & Swasey...and others.

Representatives in principal cities. Prompt deliveries. Send for Catalog No. 101, containing full engineering data.

Blank jaws available from stock

S-P ROTATING AIR CYLINDERS

Speed production. Piston packings "replace" themselves . . . saves downtime. Prompt deliveries. Send for Catalog 101.

OTHER S-P PRODUCTS: Parallel Grip Collet Chucks, Drill Press Chucks, Expanding Arbors, Blank Jaws, Hydraulic Cylinders, Air Cylinders, Air Valves, Air Pistons, Air Control Accessories.

THE S-P MFG. CORP.
ESTABLISHED 1926
12415 EUCLID AVENUE
CLEVELAND 6, OHIO
A Bassett Company

George B Furey has been appointed to Honan-Crane's sales engineering staff. Mr Furey, who will make his headquarters at the company's main office in Lebanon, Ind, will cover the central and northwestern part of the state, including South Bend and Indianapolis.

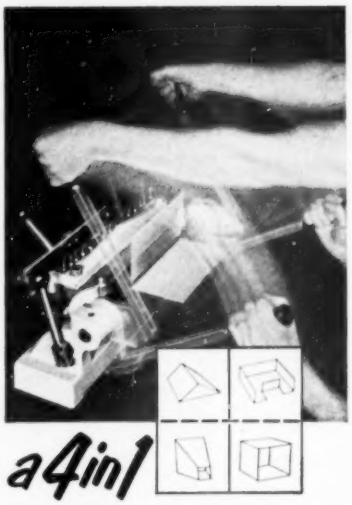
Roland Whitehurst has been appointed general manager of Electric Storage Battery Co's Industrial Products Div. Mr Whitehurst joined the firm in 1908; in 1948 he was made vice president in charge of sales, and in 1951 elected to the board of directors. His new assignment, in addition to his regular duties, completes the company's program for separation of operations into two divisions—industrial and automotive products.

Arthur E Nicholson, Jr, has been elected president of W H Nicholson & Co Machine Works, Wilkes-Barre, Pa. He succeeds **Harry S Nicholson, Sr,** who has been with the firm 52 years, and its chief executive since 1948. The former president will remain a member of the board and serve in an advisory capacity. Prior to his appointment, Mr Nicholson, Jr, was a member of the board, controller, and assistant general manager. **John M Robinson, Jr,** and **Arthur N Rinehimer** have been promoted to assistant general managers.

Ben Snyder has been appointed sales engineer at E W Bliss Co's Dayton, Ohio office. Mr Snyder has been associated with the Bliss Toledo Service Div since 1945. **Howard K Segerlind** has joined the Can Machinery sales office in New York; he formerly served for six years as an engineer specializing in can machinery for the company.

Albert E Merwin has been appointed sales and technical service manager of the Lurium Aluminum Div, Fromson Orban Co, New York. Mr Merwin, formerly product manager of the Container Div, Kaiser Aluminum & Chemical Sales, will assist metalworking plants in the fabrication and finishing of the new, high-purity aluminum.

Nelson C Walker has been appointed director of manufacturing for all plants of Mechanical Handling Systems, Detroit. Prior to his appointment he was general manager of American Car & Foundry, and served as chief engineer and assistant to the vice president of manufacturing at Noma Electric Corp.



a4in1

metal working tool!

di-acro* **BOX FINGER BRAKE**

Accurately, Easily, Quickly Form and Duplicate a Wide Variety of Shapes in Metal as Heavy as 16 Gauge—Widths up to 24" —with Versatile Di-Acro Brakes.

A number of forming jobs can be done with the Di-Acro Box Finger Brake, by simply adjusting or changing the type of mounting bar on the contact surface. Di-Acro Finger Brake is:

- **Box and Pan Brake** — when equipped with a complete set of Box Fingers.
- **Open End Brake**—when Open End Finger is installed in place of Box Fingers.
- **Bar Folder** — when an Acute Angle Bar replaces the Box Finger Bar mounting.
- **Standard Brake** — when a Forming Bar is mounted for heavy operations.

Di-Acro Standard and Radius Brakes are also available. Ten models in all.

**pronounced Die-ack-ro*

WANT MORE INFORMATION?

Send for New 32-Page Catalog

Gives facts on Di-Acro Brakes and also both hand and power operated Di-Acro Benders, Notchers, Punch Presses, Rod Parters, Rollers and Shears. Mail your request today.

Creators of "Die-Less Duplicating"

O'NEIL-IRWIN MFG. CO.
311 Eighth Ave.
Lake City, Minn.

di-acro PRECISION METALWORKING MACHINES

Robert H White, president of Gulf States Distributing Co, Houston, Texas, has been named sales representative for **Snap-Tite, Union** City, Pa, manufacturers of the Hi-Flow line of quick change couplings. Mr White will handle the company's products throughout the southern part of Texas.

Victor Frank Tripoli, former design engineer with Gaynes Engrg Co, Chicago, has joined Illinois Institute of Technology's Armour Research Foundation as a design engineer in the machine structure section of mechanism and dynamics.

James Bere has been appointed sales engineer for Clearing Machine Corp. He will represent the Chicago power press manufacturer in southern Ohio, Kentucky, and West Virginia.

ROUND TABLE *Discussion*

SAFETY SNOOP

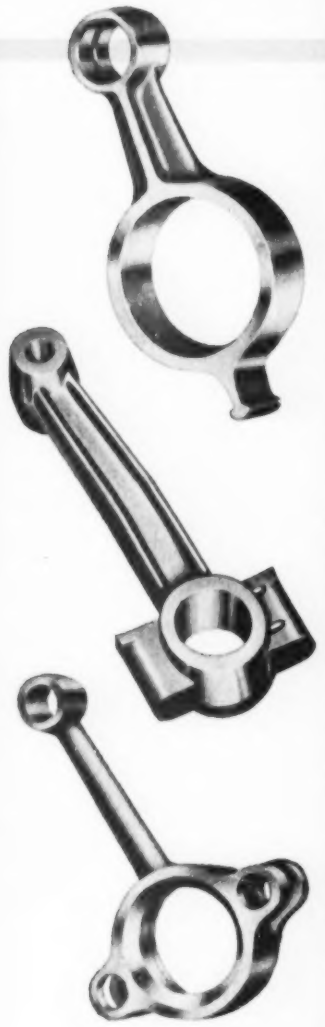
How should the problem of shop safety best be handled? Is a full-time safety engineer, with authority to specify changes, the answer, or will the workers operate better under a general safety program?

WHETHER OR NOT A SHOP needs a special man to look after safety devices and promote a spirit of careful consideration while working depends upon the size of the shop.

In a small shop a safety-minded foreman or other executive might head a safety committee whose duty it is to suggest safety measures and look after the carrying out of such decisions that might have been ordered by management. In the larger shops a safety department headed by an experienced engineer should be organized to handle all problems in this connection.

The duties of a safety department should include, first of all, stirring up an air of safe working among all concerned. This might be done by giving lectures, putting up posters, talking individually to each worker, reminding them of safe working practices, at the same time making notes of such suggestions as may be useful for safe production.

TWO MILLION WITHOUT A FAILURE!



parts: small connecting rods

alloy: "600" series metal, a high strength bearing bronze that contains no tin

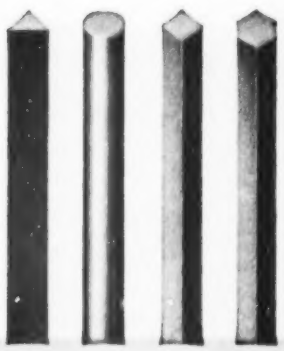
quantity to date: over 2,000,000

number of failures: none

forged by: Mueller Brass Co.

advantages: no bearing insert is necessary on either the wrist pin or crankshaft end because each rod acts as its own bearing. Dense homogeneous grain structure, close dimensional tolerances and high mechanical properties often permit redesigning for weight savings as high as 15% to 25%. "600" alloys have low coefficient of friction, high resistance to corrosion and tensile strength 2½ times greater than cast phosphor bronzes.

uses: compressors, outboard motors, small high speed gasoline engines. Best results are obtained if they operate against hardened, ground and polished shafts.

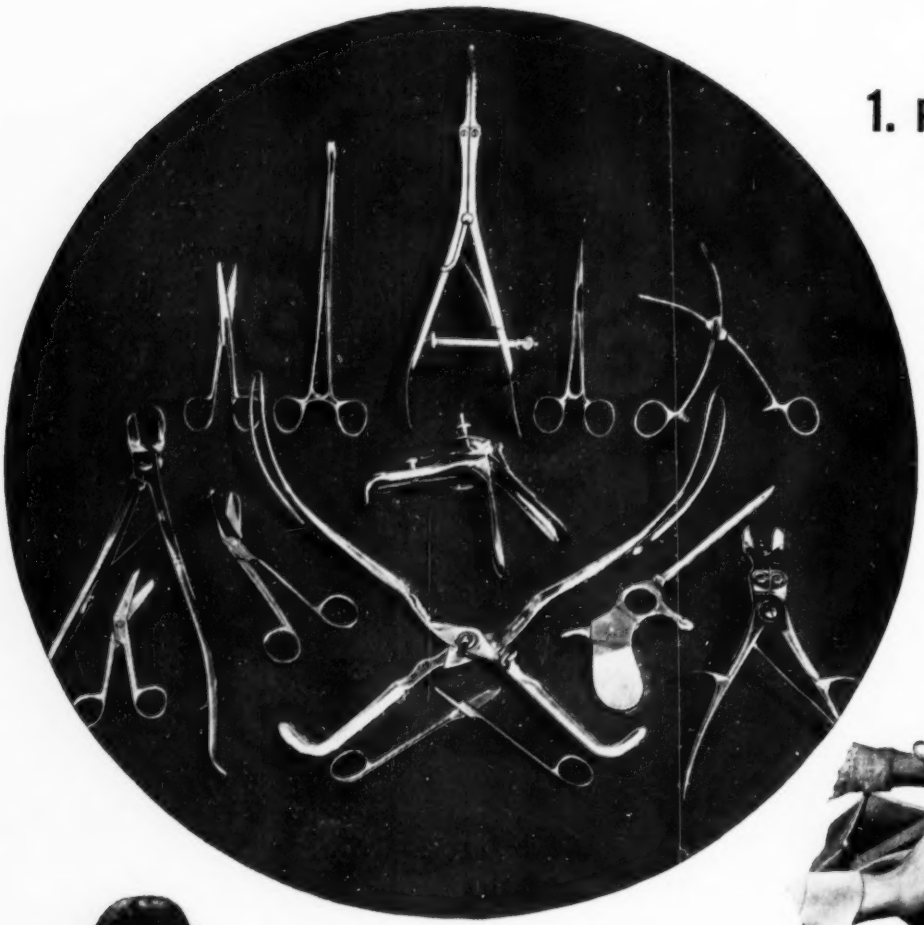


"600" SERIES ROD is produced in standard 12-ft. mill lengths and a wide range of sizes and special shapes. This rod has a fine, uniform grain structure and the mechanical properties are rigidly controlled in the cold drawing process. Scrap loss is greatly reduced in machining operations because of the complete absence of defects. For complete information, write us today.

104

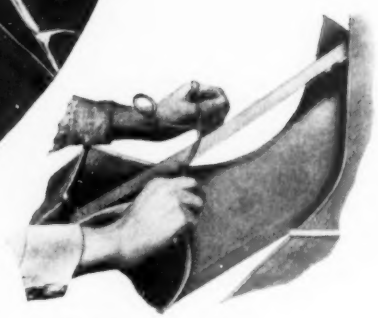
MUELLER BRASS CO.
PORT HURON 23, MICHIGAN

HOW WOULD YOU SOLVE IT?



1. PRODUCTION PROBLEM:

To produce a more uniform finish on the multiple contours of stainless steel surgical instruments and cut unit costs of finishing and polishing. Witte & Schmitz Surgical Instrument Co. was using set-up wheels which left unsatisfactory finishes, tired operators.



2. SOLUTION:

A 3M Representative suggested that this Bridgeport, Conn. manufacturer switch to the 3M Backstand Method using Three-M-ite "Resinite" and Three-M-ite Cloth Belts. A 3M Methods Engineer helped the firm make up their own spindles and mounted wall idlers to make best use of limited space.

3. RESULTS:

An immediate 25% production increase with a far superior finish on the instruments. Too, the manufacturer found that unskilled workers could be trained to polish the multiple contours more rapidly, and there was less operator fatigue. 3M Representatives can help solve *your* grinding problems, too. Send coupon for facts.

WANT MORE INFORMATION?

Minnesota Mining & Mfg. Co.
Dept. AM-113, St. Paul 6, Minn.

☐ Send me free booklet: "Case History Reports on 3M Abrasive Belts."
☐ Have 3M Representative call.

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

3M® ABRASIVES

Made in U.S.A. by Minnesota Mining & Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: London, Ont., Can., Export: 122 E. 42nd St., New York City. Makers of "Scotch"® Pressure-sensitive Tapes, "Scotch"® Sound Recording Tape, "3M"® Adhesives, "Underseal"® Rubberized Coating, "Scotchlite"® Reflective Sheeting, "Safety-Walk"® Non-slip Surfacing.

Usually the safety engineer investigates all accidents immediately after they have occurred to find out why they happened, and to collect statistics. He might also be called upon to investigate drawings for new tools, and quotations on new machine tools, to see if the safety question is adequately taken care of. This is much better done before a tool is made or purchased than after some accident has occurred.

Dust removal, noise, testing of hooks, chains, and wires for lifting purposes also belong to the safety department.

To prevent workers from removing guards from presses and other machines, each man should be instructed as to how risky and foolish it is to do so. In some European countries the worker loses part of his compensation in case of an accident of this kind.

Ed is far behind the times when he says he doesn't want anyone putting useless guards on any machine that's going to be used by an old hand for special jobs. In a large shop where I was a tool designer, a man had been working at a big press for 25 years and had never had an accident. I expressed my surprise several times that his foreman let him work without any guard at all. The very last day he worked at this press he lost his right hand. This is only one case out of thousands. So please, Ed, never say again that experience alone is sufficient to prevent accidents; guards should always be used.

Organizing a safety department or employing a safety engineer has nothing to do with infringing on a foreman's authority. It is a help to the foreman, and not a drawback. Foremen as a rule have so many things to look after that it should be a relief if the responsibility for preventing accidents is turned over to a special, competent man. It doesn't matter whether he's called snooping supervisor or safety engineer. Any man who specializes on a single duty gets much further than a guy who has many things to attend to. But of course this doesn't prevent a foreman from taking part in a safety program staged by management.

Responsibility for safety problems in medium and large shops requires special studies, research, and much knowledge that a regular foreman does not possess. An experienced safety engineer can keep the operators alert to safety hazards far better than any foreman or noisy campaigns arranged by management.

A E Fristedt
Stockholm-Bromma, Sweden

Check the features of this new line of multiple plate clutches: Integral oil cylinder clamps plate stack, automatically maintaining constant torque . . . *eliminating* all need for adjustment. *High torque capacity*—directly proportionate to oil pressure—permits use of smaller, more compact clutch. *Readily adaptable to remote control,* thus eliminating complicated actuating linkage.

That's the performance you'll get from the new Twin Disc Model MOS (single) or MOD (duplex) Oil-Actuated Multiple Plate Clutch.

Write for complete information.

Model MOD (duplex) Oil-Actuated Multiple Plate Clutch—cutaway view shows integral oil-cylinder. Also available in Model MOS (single).

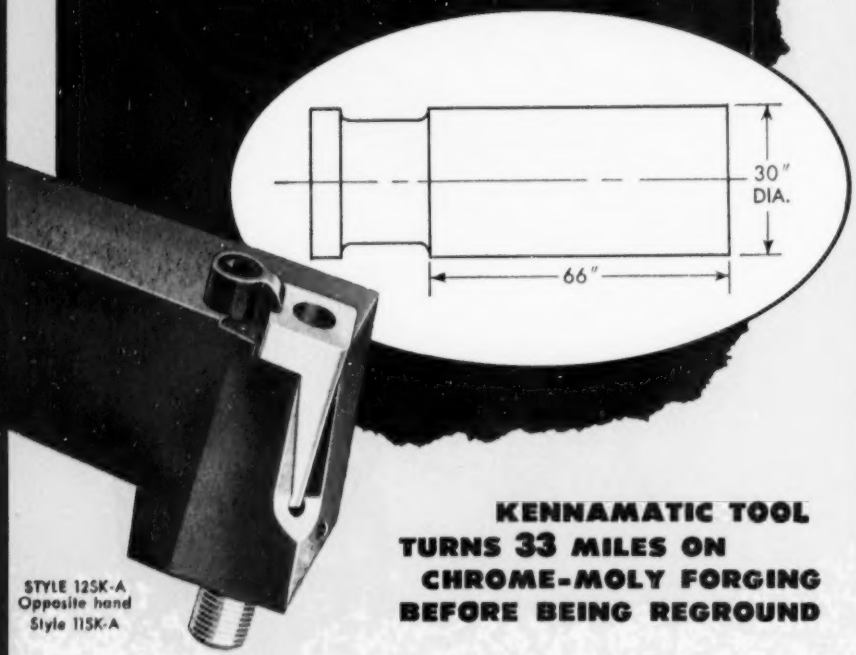
TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

Here's Marathonian MACHINING



STYLE 125K-A
Opposite hand
Style 115K-A

KENNAMATIC TOOL TURNS 33 MILES ON CHROME-MOLY FORGING BEFORE BEING REGROUND

A 33 mile run before wearing out is a noteworthy record. Kennametal tools this strenuous course in stride.

To turn a 30" diameter 66" long chrome-moly steel forging—very rough and scaly—was a difficult problem. Carbide tools (not Kennametal) were unsatisfactory. HS steel tools were too slow and costly; they had to be reground after turning only 5" of the surface at 3 RPM, .093" feed, and ⅞" cut . . . 20 to 24 tool changes were required to complete one roughing cut and one finishing cut.

The problem was solved with a Heavy Duty Kennamatic tool, 1¼" square, Grade K2S insert. At a speed of 19 RPM and .020" feed, the 66"-long ⅞"-deep rough cut was made. Then the insert was indexed and finishing cut run. Utilizing the eight available cutting edges, no grinding was necessary until four forgings were completely machined. This represents 33 *miles* of lineal turning, in contrast to the best HSS performance of *422 feet.*

Making short work of long turns is common with Kennametal. Ask our Tool Engineers to demonstrate. Kennametal Inc., Latrobe, Pa.

KENNAMETAL
CEMENTED CARBIDE TOOLING
THAT INCREASES PRODUCTIVITY

SAFETY SNOOP

FORTY YEARS AGO, while I was still an apprentice, the operator of a Gray planer asked me to give him a lift. I shut down my machine and went over. This man had a large casting weighing over five tons chained, and had hooked on to it with an old-fashioned chain block. The fall chain was short, the chain block was rusty and stiff, and the casting was so shaped that when one pulled on the fall chain, one's toes were under the rising casting. To top it off, the chain block was rated at one and one-half tons. The job didn't look good to me and I said so.

While we were arguing the boss came along. I appealed to him.

"It's OK, kid," he said, "them Yale blocks will move a mountain."

The Master had spoken. So I pulled. A chain broke and I went to the hospital with a crushed ankle. Months later, the business manager of the company settled with me for fifteen cents on the dollar, after reviewing my case, and giving me a lecture on culpable negligence.

A year after this I was straddling the drive shaft of a trommel screen revolving at a speed of 21 rpm. I was wearing a brand new pair of overalls. Suddenly, I felt a tug at my left leg near the ankle, and then a tug at my right ankle. I grabbed two steel uprights and held on. A square-headed protruding setscrew had snagged the cuff of my overalls, first on one side and then on the other, and was quietly wrapping them around the shaft with me in them. I couldn't reach the clutch, and there was no one in sight to appeal to for help. Bit by bit those overalls stretched, and finally tore, first at the shoulder straps and then down the leg seams. I lost my overalls, my pants, my underclothes, my shirt, and one sock. Just how a lineshaft can pull a sock off one without taking the shoe, I wouldn't know, but it happened. Just for a moment I was careless, and I very nearly paid for this carelessness with my life.

I saw an oiler, working up on a lineshaft runway, stoop over to fill his squirt can from a gallon can. He had waste protruding from his hip pocket. As he bent over, he backed into a revolving clutch. The clutch snagged the waste and the oiler, whirled them around the shaft for a while then threw them on the floor thirty feet down. Every bone in the man's body was broken. It was not funny.

IT'S NEW... lo-jet acro*

the revolutionary new coolant system that . . .

keeps cutting tool and work at room temperatures!

lo-jet acro's *proven results in America's leading industries are making production history, from coast to coast!*

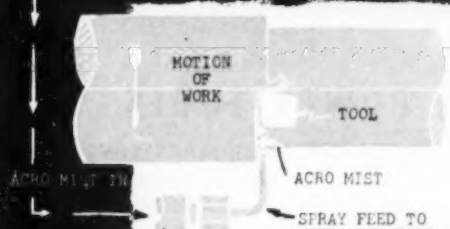
* Controlled compressed air operation for all types of metal cutting with special ACRO-COOLANT soluble solution.

Pictured here is the 8⅛" outlet centrifugal equalizer distributor with 8 copper tube spray feed. This assembly serves 8 cutting operations.

lo-jet acro

- prolongs tool life
- cuts tool breakage loss
- saves money
- speeds production
- keeps work clean

there is a **lo-jet acro** *system for every purpose and every machine.*



write now for more information at no obligation.

Our engineering staff will cooperate free of charge.

lo-jet acro *is a product of,*

AIR CONVERSION RESEARCH
CORPORATION

4107 North Damen Avenue • Chicago 18, Ill.

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Gentlemen: Please send me full information about **lo-jet acro's** coolant system.

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city and zone _____ state _____

You're HOOKED but GOOD

with a Jarvis TAP

We Mean, of course, the "custom made" controlled hook ground in the flutes of a Jarvis Tap. Our highly accurate machine fluting process, in which wheel radius, depth of grind and indexing are painstakingly controlled, is a guarantee that the amount of hook ground for your particular needs will be precisely met!

for a "CUSTOM MADE" Tap at no extra charge for the finest Taps made —

See Your JARVIS Representative

Jarvis POWER TOOLS

- TAPPING ATTACHMENTS
- TAPS
- FLEXIBLE SHAFTS AND MACHINES
- ROTARY FILES
- TUNGSTEN CARBIDE REAMERS AND MILLS
- DRILLS
- BORING BITS

Send for complete catalog.

THE CHARLES L. JARVIS CO.
MIDDLETOWN IN CONNECTICUT

At one time I had seven men working on one punch press at the same time. We were running four dies on that press, and the job was dangerous. We had thirteen sets of push buttons wired on the press as a safety measure. Six men had to depress buttons with either hand, and the operator had to depress buttons with his left hand before he could trip the press. Safe, you would think. But a man lost his hand on that press. The men, who were working piece work, had propped all thirteen sets of buttons open with pins in order to make time.

Would a hoo-rah safety campaign with stickers and gory posters have prevented just one of those accidents? Never.

Then, what is the answer? It's safe workers, and never-ending vigilance in the training of safe workers. It's making safe workers out of everybody, and you start training them when they are born. There never was a born safe worker. Thousands of folks, including myself, try to live and work safely. All of us need continual cautioning, checking, reproving, and warning.

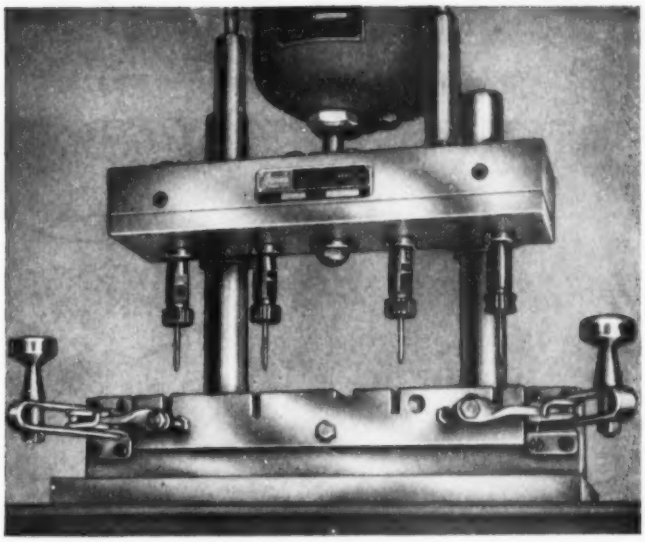
I favor strongly the quiet type of roving safety man, who spends his days out on the shop floor where accidents happen, and not the office type who spend their days in an office filing away literature received from some national safety council who write about accidents and draw up gory pictures, but never get around where accidents real'y happen.

I like that safety man who tells a young lathe operator, "Charlie, we don't wear four-in-hand ties when we run a lathe. Take it off. Wear a bow tie, or nothing." The type of man who tells me, "You know better than to talk to that man while he is operating a machine. If the talk is important, have him shut the machine down."

I've served an apprenticeship at the machinist trade, and I've graduated from several colleges. None of those institutions can teach safety. A good safety man, who is on the prowl continually, and is thinking about his job, can do more effective work in instilling safe working habits into the rest of us than any other type of individual or training that one can receive. Safe working habits are simply a safe way of living; they should be born in every home, and when they are not, that home generally furnishes a statistic to the world's collection of accidents.

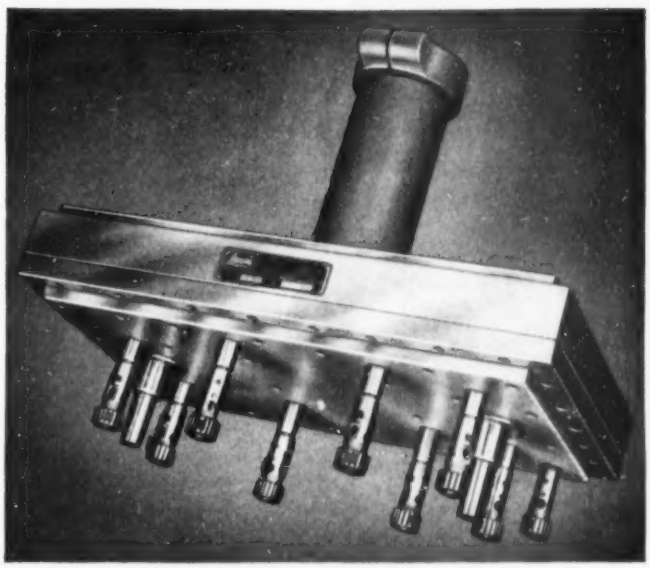
James K Matter
Detroit, Mich

For Multiple Tapping and Drilling . . .



AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

Jarvis MULTI-TAPPERS



Engineered and built to your specific production requirements from our basic standard components, Jarvis Multi-Tappers can be furnished for any type of drill press available.

We invite your inquiries—let us assist in analyzing your tapping and drilling needs!

Send for our catalog featuring Jarvis Multi-tappers

NEW FEATURES OF JARVIS MULTI-TAPPERS

include:

- Aluminum case—Jig bored.
- Gear driven—positive action, silent drive.
- Ball bearings throughout.

WHEN POWERED WITH A JARVIS TORQOMATIC DRIVE THE JARVIS MULTI-TAPPER PROVIDES THE MOST EFFICIENT AND PRODUCTIVE MACHINE IN THE FIELD.

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

KELLER Air Tools

where Extra Power is needed

ANOTHER EXAMPLE OF
KELLER *Air Tools engineered to industry*

FACTS IN BRIEF
ABOUT KELLER NUT SETTERS

Weigh less

Consume less air

Interchangeable parts

Reduce operator fatigue

Torque controlled from 20 to 70 ft/lb

Running down and tightening the nuts which attach hinge arms to an automobile hood requires a nut setter with extra power. The Keller 16-C Nut Setter has an especially powerful motor capable of handling machine screw nuts up to 5/8". . . yet for all its power it is light in weight and easy to handle.

In the illustration above, the 16-C Nut Setter is provided with a 90° attachment to deliver power at a more convenient angle.

Keller Air Tools deliver more power per pound — speed production and reduce costs. We would like to tell you more about them.

Wide variety of handles, gearings, speeds, and angle attachments

Send for
FREE 36-Page Booklet
for more information and interesting ideas on air tool application

Keller Tool Company, Grand Haven, Mich.
Please send me a free copy of your booklet on Pneumatic Screw Driving and Nut Setting Tools

Name _____ Title _____
Company _____
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City _____ Zone _____ State _____

SAFETY SNOOP

I WANT NO SNOOPING safety engineer, or whatever you choose to call him, gaping around where I'm working. They can put up all the safety signs and pictures around they want and I can look at them or not. It won't make any difference to me as I'll just plug along in the usual way and look out for myself.

When picture psychology first came out I was interested but it didn't faze me one iota other than to enable me to appraise a work of art. I've worked for years without any serious accident simply because I've been careful and had my mind on my work. You can't live through the night before and still be assured that you can get through the day without a scratch. Oh, I've cut my fingers a time or two because of lack of caution, or must I be honest and call it damn foolishness when I, in my impatience, grasped a curling chip to get it out of the way and received the benefit of the sharp edge. I can't see where any poster will influence me in what I'll do.

As for appointing a costly, inquisitive official to the position of safety engineer, I think it is an idiotic move. I've seen one of these so-called experts recommend some of the damnedest contraptions be installed around the various machines and I have also noticed that it would take a six-legged spider to weave his way around the obstructions in order to perform some useful work. It was laughable in a way, but tragic in another; the big shot safety man had just given the shop the once-over and put his stamp of approval on the whole she-bang when one of the men met up with a serious accident. It so happened that two lathes were end to end, headstock to headstock, and they were those old-fashioned mementoes with exposed change-gearing. One of the men had just taken a peep at the plate which informed him of the proper gears to cut a certain thread and then proceeded to change the gears when his elbow came in contact with the gears on the other fellow's machine. When one gets the tough flesh of an elbow between a pair of gears you can bank on it that he's in for a painful session that isn't very short. The very thing that the safety man should have spotted, he passed up; instead, he was making a big ado about an exposed belt.

Some of these safety engineers, some of them representatives of the State, make my blood boil. I remember one who came into our shop and "ordered"—with that big-shot insistence—the placement of so many guards about the machinery that, if

EXTRA AUXILIARY CONTACTS

for ALL Allen-Bradley Starters . . . Sizes 0 to 7

Auxiliary Contacts—Sizes 0 & 1

NOW . . . it's easy to add auxiliary contacts to A-B solenoid starters to operate extra relays, pilot lights, or other accessories. Just follow the steps shown below.

Bulletin 895 auxiliary contacts come in forms to fit all sizes of starters . . . with either single pole normally open, normally closed, or normally open-normally closed contacts. They can be added to any A-B starter in stock or in service.

Auxiliary Contacts—Sizes 2 & 3

ADD ONE OR TWO AUXILIARY CONTACTS TO ANY A-B SOLENOID STARTER

Bulletin 709 Size 0 starter with auxiliary lock-in contact

Bulletin 709 Size 0 starter with one extra auxiliary contact

Bulletin 709 Size 0 starter with two extra auxiliary contacts

SIZE 0 STARTER

One or two extra auxiliary contacts can be mounted on Size 0 arc hood. Terminals are easily accessible from front. Rugged—simple—trouble free.

Bulletin 709 Size 1 starter with auxiliary lock-in contact

Bulletin 709 Size 1 starter with one extra auxiliary contact

Bulletin 709 Size 1 starter with two extra auxiliary contacts

SIZE 1 STARTER

One or two extra auxiliary contacts can be mounted on Size 1 arc hood. Terminals are accessible from front. Existing wiring not disturbed in any way.

Bulletin 709 Size 2 starter with auxiliary lock-in contact

Bulletin 709 Size 2 starter with one extra auxiliary contact

Bulletin 709 Size 2 starter with two extra auxiliary contacts

SIZE 2 STARTER

Mounting plate will hold one or two extra Size 2-3 auxiliary contacts. It is attached to starter using existing arc hood threaded studs and lock nuts. Solenoid plunger of starter actuates the auxiliary contacts.

Bulletin 709 Size 3 starter with auxiliary lock-in contact

Bulletin 709 Size 3 starter with one extra auxiliary contact

Bulletin 709 Size 3 starter with two extra auxiliary contacts

SIZE 3 STARTER

The Size 2-3 mounting plate will also fit the Size 3 arc hood and support one or two auxiliary contacts. Easy to install and simple to operate. Trouble free performance is guaranteed. No contact maintenance.

Contact arrangements are readily changed from normally open to normally closed, or vice versa. This flexibility opens new possibilities for applying Allen-Bradley contactors and starters to automatically controlled equipment.

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A-B Quality

ALLEN-BRADLEY

MOTOR CONTROL

8-53-MR

MAKE YOUR OWN TERMINAL STRIPS

with these handy

BULLETIN 892 TERMINAL BLOCKS

EASILY MADE UP IN ANY LENGTH TO MEET YOUR TERMINAL STRIP SPECIFICATIONS

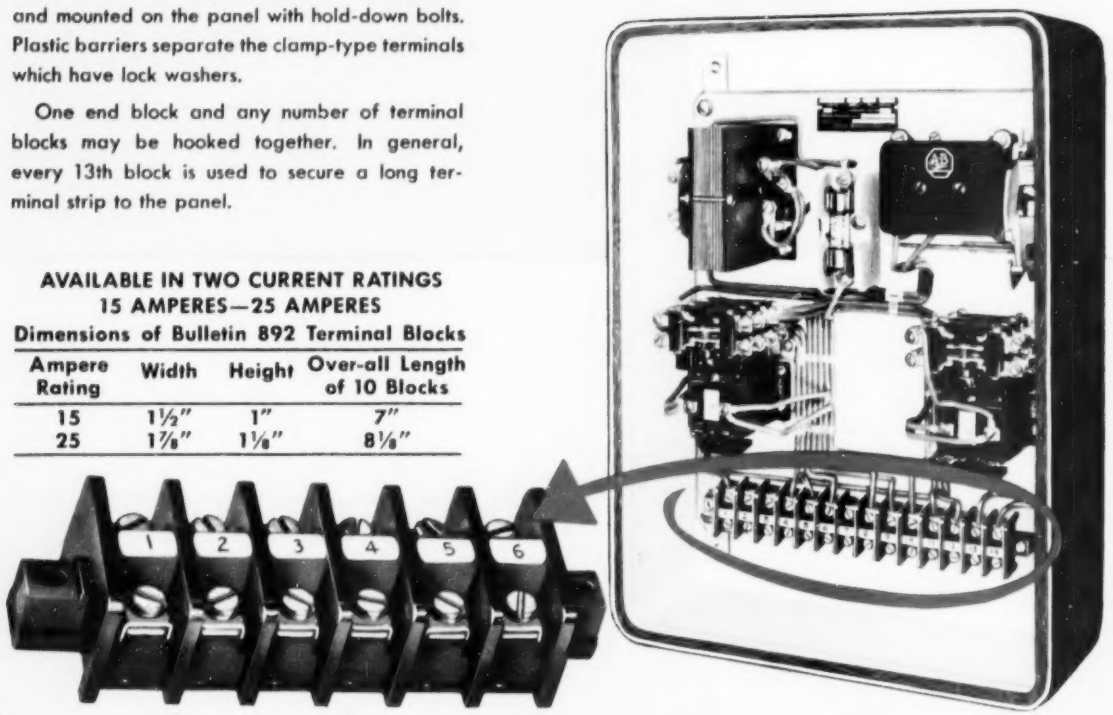
Bulletin 892 terminal blocks interlock in perfect alignment to provide the exact number of terminals for any panel board. There are no excess terminals—hence, no waste of panel space. The required terminal strip can be assembled quickly and mounted on the panel with hold-down bolts. Plastic barriers separate the clamp-type terminals which have lock washers.

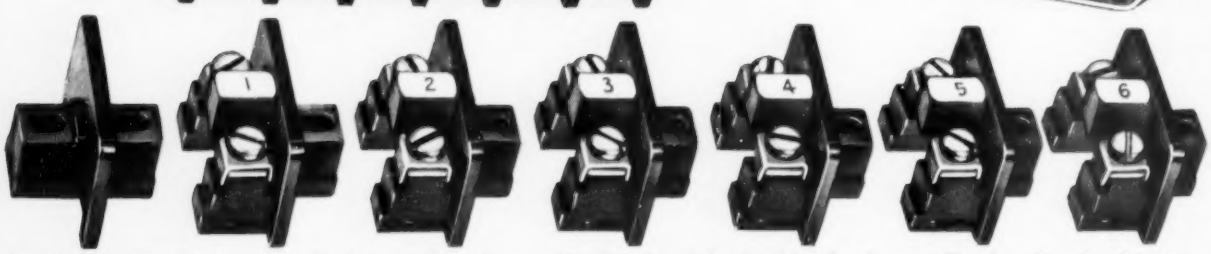
One end block and any number of terminal blocks may be hooked together. In general, every 13th block is used to secure a long terminal strip to the panel.

AVAILABLE IN TWO CURRENT RATINGS
15 AMPERES—25 AMPERES

Dimensions of Bulletin 892 Terminal Blocks

Ampere Rating	Width	Height	Over-all Length of 10 Blocks
15	1½"	1"	7"
25	1⅞"	1⅛"	8⅛"





INTERLOCKING TERMINAL BLOCKS

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

8-53-MR

his ideas were carried out, the workers would be stymied; they'd have to carry can openers in order to find their way around.

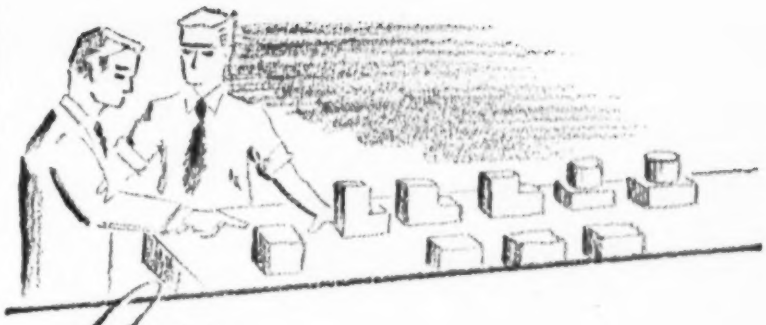
No, I've no truck with these safety fellows who evidently haven't had a machine handle within a mile of their controlling hand. I don't want any fence-specialists snooping around me when I'm working along contentedly or I'll likely drop a two-foot pipe wrench on their toes. Why not put the money that they would pay a safety expert to better use—for instance a couple of cents an hour or possibly an extra day's vacation now and then. I know how the workers enjoy an extra day to look around in the outside world—Lord knows they are cooped up enough throughout the year. Keep the safety snooper out of it and you'll have happy workers who'll look out for their own safety.

I have handled departments in my time and I can say with no hesitation whatsoever that I wouldn't tolerate any outsider coming around telling me what to do with my machines. As a department head I would be the head in fact and would allow no snooper to have any say about my department except, of course, my immediate superior.

Jack Everett
San Francisco, Calif

THIS IDEA OF a safety engineer doesn't strike me as being a bad idea at all because a man will work along perfunctorily, paying no attention to something that might possibly lead to an accident. It is this situation that calls for a man whose duty it is to discover. It is his mission in the plant, and he can visualize where things are needed to establish safe working conditions. The safety specialist should, however, hold a conference now and then with the various department heads to discuss pertinent matters leading up to a reduction of accidents.

"Every morning the same thing—trying to get that newlywed in before the bell!"



Cut **PRODUCTION COSTS with the** *right* **plant layout**

Many of our clients are amazed by the cost savings realized when we "revamp" their plant layouts. This entails the rearrangement in equipment, the elimination of unnecessary handling operations, and the complete reorganization and integration of their "production flow".

The right kind of plant layout stems from an objective approach toward every phase of production. It helps to iron out all the production "kinks", reduce inventories, lower handling time, eliminate back-tracking, and assist in production control.

Pioneer has developed a thorough system of procedure in transferring the poor plant layout into one that reaps cost savings far beyond anything anticipated by the client. This procedure entails the preparation of process flow charts, taking into consideration such factors as methods, material handling, temporary and permanent storage, and inspection of materials. The flow chart is then transferred into a set of templets . . . or scale models . . . which is developed into a plant layout, allowing us to analyze the client's production from all angles.

We'll be glad to help show you how to cut production costs . . . with the right plant layout . . . tailored to meet your specific production needs! Send today for Bulletin 162-G on "How to Harness Your Production".

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Detroit 3 Mich.

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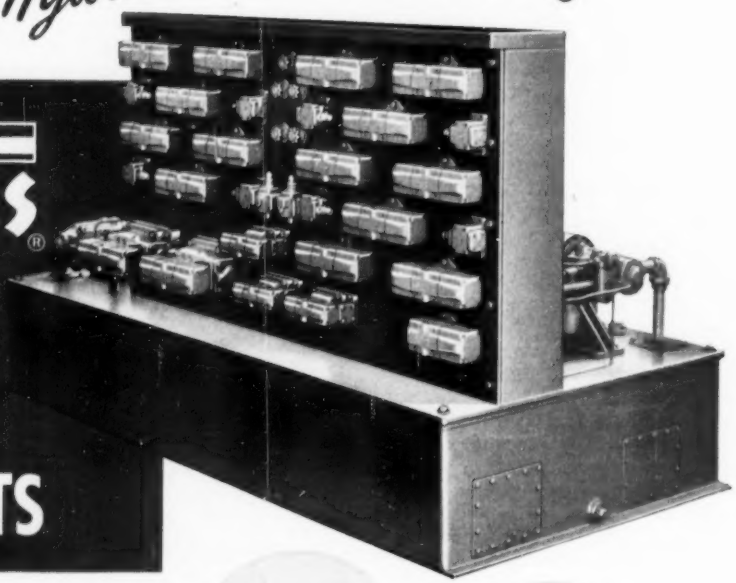
Then Why Buy Hydraulics Piecemeal?



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You would never go to the trouble of buying automatic washing machine parts and assembling them yourself. It would take a lot of time and patience and trouble. For one thing the maker could not risk guaranteeing the finished job. You buy a washing machine as a unit, and want the undivided responsibility of the manufacturer.

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Hydraulic design is simplified and improved, and you save substantially on installation and maintenance cost. Vickers takes undivided responsibility for the entire hydraulic system and you get the benefit of Vickers skill and experience. These advantages are important to both the machine builder and his customer.

Ask the nearest Vickers factory-trained application engineer to send you new Bulletin 52-45 or to make a personal call.

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Reduce Installation and Maintenance Costs

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6071

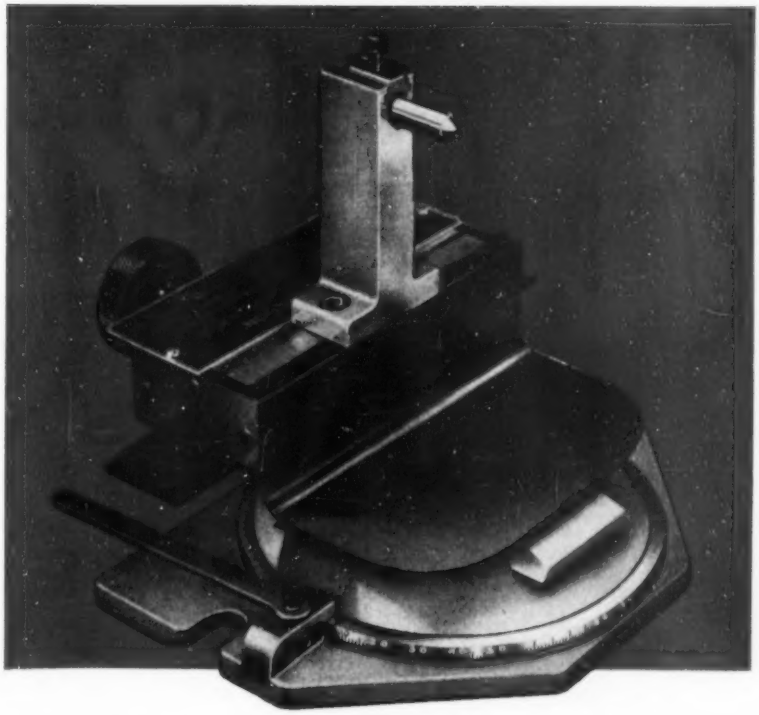
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

There are times in almost everyone's life when he will get careless. It may be that he will take too many chances while at his work in order to make a showing. I know what I am talking about, as this was the condition pervailing at the time of an accident I had when I was a young squirt full of zest to get along in the world. I said to myself, "I'll get this out in a hurry and then hit the boss for a raise." Unfortunately I didn't get that far, as profusely-flowing blood prevented me from doing so; I was perfectly agreeable to go home swathed in bandages and decided to remain content with my pay until a more propitious time.

There are times when a man may not be at his best spiritually, emotionally, or physically, and at such times he gets off the ball and isn't quite responsible for his actions leading up to some misjudgment causing injury. The poor sucker could be looking right at an 18-lb sledge hammer coming straight for his head, yet his reaction is considerably retarded. Safety signs or safety engineers could not help in this situation other than that of building a fence around the worker himself. It could be, and it often happens, that the worker is upset by a reprimand he got from the foreman. This is a condition for a plant psychologist (a plant common-senser) to handle so as to bring the frustrated one back to a happy normalcy.

You'll find that invariably a man will meet with an accident when on a rush order where the desire to accomplish something overcomes the necessary caution given in normal times. I took particular note of my own condition yesterday in the drafting room when a job was given to me to look over in a hurry as it was to be gotten right out. Some kind of poison was injected into my bloodstream by the rattle-brained glands which seemed to upset me no little bit. The chances were had I been on a machine at the time, I would have ploughed into something and caused a wreck. Remedy for such a condition is for the supervisor to provide sufficient time for a man to do a job without having to tear his head off. Safety posters or safety specialists in such a situation—phooey!

Perchance a man is anxious to get his job out of a machine so as to leave it free for the on-coming shift and swirls caution to the four winds in order to get the job through. In doing so he lacks the necessary caution and gives his index finger a hell of a big gash. Safety pictures or safety wizards couldn't have pre-



Dress formed grinding wheels to a .0001" accuracy with the

B-1 Angle tangent to radius DRESSER

This easily operated formed wheel dresser is of sturdy construction and has exceptional built-in accuracy. Simple or complex forms can be dressed on grinding wheels to an accuracy of .0001". Years of use in thousands of plants have proved the worth of the Vinco Model B-1 dresser on production work as well as tool room and gage grinding operations.

Prompt Delivery

VINCO CORPORATION
9125 Schaefer Hwy., Detroit 28, Mich.

FREE! Send for this fully illustrated folder today. It's full of operating information and details concerning the famous B-1 dresser.

THE TRADEMARK OF DEPENDABILITY

VINCO
MILLIONTHS OF AN INCH FOR SALE

to Transportation and Industry...

From humble beginnings in 1868—when Cleveland was only a struggling industrial community on the shores of Lake Erie—National Malleable and Steel Castings Company has developed into a world-wide organization.

During these 85 dynamic years of our country's industrial expansion, National has pioneered in developing new methods and processes for producing castings of the highest integrity for many industries.

Today, we serve the automotive, marine, railroad, farm equipment, mining, and defense industries from six plants strategically located throughout the nation. Each foundry is modern . . . fully mechanized . . completely equipped with all necessary facilities, including metallurgical laboratory—for quality-controlled volume production.

For your malleable and steel castings let us match our experience and service against your production problems and production schedule.

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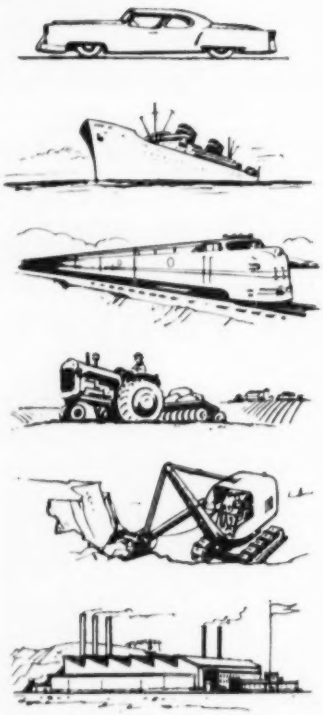

NATIONAL

MALLEABLE AND STEEL

CASTINGS COMPANY

Cleveland 6, Ohio

vented it, as it is up to the man himself; he just sticks his neck out for a moment and bingo!

In my own case I have suffered considerably because of my own thoughtlessness. I once held a piece of copper rod against the end of an armature shaft so that my pal could give it a couple of good swipes with a heavy sledge in order to remove the commutator. Had I used a pair of tongs to hold the copper, I would not have wound up in the plant hospital with a battered hand. I just didn't think. Had a safety engineer been on the job and seen me, he would have stopped me from being such a jackass. In other words he would have done some thinking for me and saved my hand.

I could go on and on enumerating various incidents wherein I suffered injury simply because of my mental sluggishness at the time. As a youngster in my teens it was my pleasure to operate a large electric crane. It was painting time and painters were busy decorating the structural work. To my surprise and intense horror, one of the painter's shoes dropped to the ground—at the same time all hell broke loose as he let out obvious yells of pain. What happened was that he carelessly leaned over to yell down to one of his buddies on the floor to send him up another brush and stuck his ankle over the crane rail in the bay before mine. Had he used ordinary precaution he would have avoided it. He didn't think, and as a consequence he had to hobble around for the rest of his life on an artificial leg. I saw another man lean his arm on a crane track that ran, arm high, along a cupola floor. He lost an arm — he didn't

"Never in the company's history have things run so smoothly as they now are during the moving of your department."

think, nor did the people responsible, by permitting men to work in such dangerous conditions before proper guards were installed.

There are times when safety rules are violated by bull-headed persons or persons who think they can get by with murder. I recall an instance where a man called for the operator to lower his block, threw his leg over the massive hook and gave the signal to raise him. He did this to avoid having to walk the distance over to the other side of the yard. The crane was not equipped with an automatic throwout; the human element entered in and failure to stop the motor caused the sheaves to crush together and break the cables. The violator didn't have to worry about any safety rules after that as he was flattened out beneath the massive block as it crashed to the ground.

How often will we see a man rush up to an emery wheel to do a bit of grinding, when the tool rest is away from the wheel, and suffer painful injury. Anyone who has suffered a grind injury knows what I am talking about. He usually doesn't take the time to adjust the rest; his main idea is to get the job done.

A safety engineer will be vigilant at all times to such neglect and call the foreman's attention to the need, regardless of whether he likes it or not. It is only a narrow-minded man who would take exception to another calling his attention to a pressing need. I'd go a little further and call the safety man a morale engineer, because there is nothing so destructive to morale than to have one see his buddy meet with an accident.

We have bills to pay for the salesman who finds it to his advantage to spend a little money to entertain a prospective customer, because it is necessary for him to do this in order to get the business. Why should we object to spending money inside the plant to bring it up to its highest standard of efficiency by making it possible for the men to produce at their very best under safer working conditions?

Frank Van Horn
Auburn, Calif

THERE IS AN old saying among safety men that accidents don't happen; they are caused. They are caused because someone did something he shouldn't have done, or somebody failed to do something he should have done. Carelessness, indifference, and neglect are responsible for one out of three industrial accidents, and losses running into millions of dollars annually. These represent not

Right at your own desk . . .

See the big difference in floor absorbents

Here's one who saw the difference:

Mr. A. Cipperman, Purchasing Agent

"I never realized the difference between oil absorbents until it was graphically demonstrated to me with the Eagle-Picher comparison test."

Smart buyers naturally want *proof* before purchase. And proof is what you get when you witness Eagle-Picher's comparative test of floor absorbents. With his portable laboratory, your Eagle-Picher representative will analyze your present floor absorbent right at your desk, or you can conduct the test yourself. Either way, there's no obligation, of course.

Here's what the test shows—

- The amount of oil and water absorbed for given bulk.
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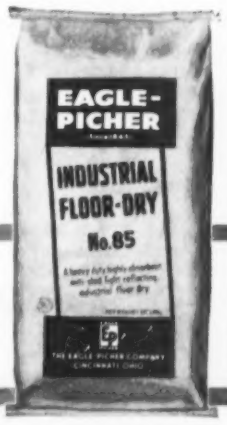
You'll see that Eagle-Picher Floor-Dry is insoluble, chemically inert and non-combustible . . . that it combines light weight for exceptional coverage with light color for brighter, safer working areas. Write today for the full story.



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Since 1843 EAGLE EP PICHER

THE EAGLE-PICHER COMPANY
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This Cleveland Model E-24 has been on the job day in and day out since July 1949. With one stroke of the machine it completes 2 pieces—Core drilling, countersinking and Tapping ¾ - 10 Thread in Malleable Iron Castings.

It is another example of how production can be speeded up and costs reduced when you bring your production problems to Cleveland. Cleveland engineers can design a machine for you that will cut costs by combining several operations. And when you get a "Cleveland" you get all the proven advantages of the famous lead screw design that means more perfect pieces per hour.

Whatever operations you require . . . Core Drilling . . . Reaming . . . Tapping . . . Threading . . . Chamfering . . . it will pay you to call Cleveland.

Write today for Catalog No. AR-119.

THE CLEVELAND TAPPING MACHINE CO.

A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.

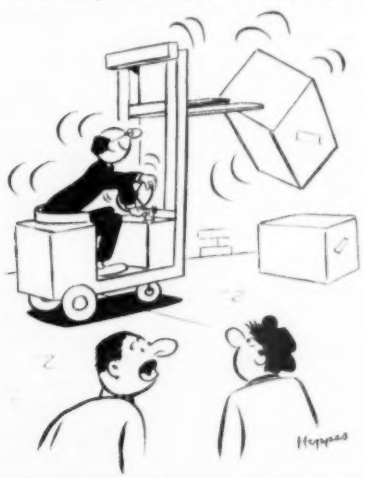
CANTON 6, OHIO

only loss of pay to employees, but to a far larger extent, loss of profits on production, increased insurance premiums and higher wage rates for these hazardous occupations to the employer.

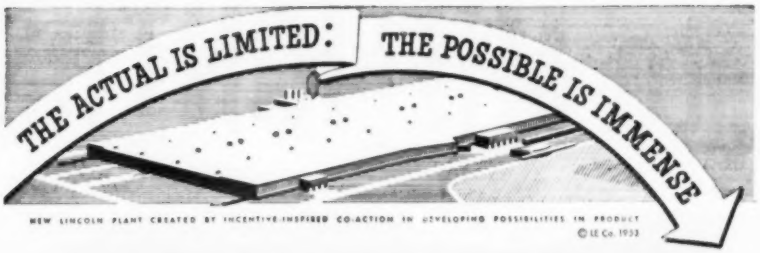
Today's safety engineers are helping industry solve its safety problems. Justification for having a full-time safety engineer responsible for accident prevention, rather than making safety one of a long list of foreman responsibilities, is found in the ability of the full-time expert to reduce accidents and save more than enough to pay for his salary and expenses.

The majority of accidents in manufacturing plants are due more to human failure than to lack of machine guards and similar devices. It is to little avail to spend time and money to build safety into the physical plant through careful layout and planning, unless the worker is willing to cooperate by observing safety practices and rules of conduct. Experience has proved that organized educational programs in industry will keep accidents at a low level, but when the enthusiasm for educational programs is allowed to fall off, there is a tendency for the number and severity of accidents to increase.

The most efficient and effective type of safety organization is one under the direction of a safety engineer. His job is to function both as adviser and motivator of safety for an entire plant. He must work closely with supervisory forces without usurping their functions. Since he does not have direct charge of departments, and must often obtain correction of unsafe conditions, he will be productive of results insofar as he can prove himself to be a leader



"He's president of the company. He always has to sneak in here and play around a little after hours!"



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT
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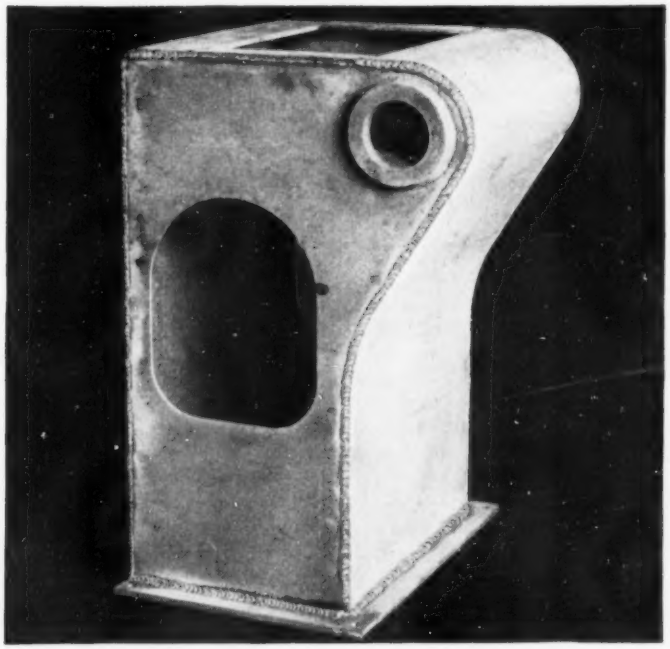

Fig. 3. Welded steel base *is made from ⅜", ½" and ⅝" plate. Flame-cut to shape, components are tack welded and then finished welded with fast down hand technique using "Fleetweld 7".*

WELDED LATHE DESIGNS CUT COSTS: SIMPLIFY PRODUCTION!

BY redesigning lathes for welded steel construction, Divine Bros. Co., Utica, N.Y. has cut excess weight from former cast bases and reduced manufacturing costs 24%. Eliminated investment in patterns.

With the present welded steel construction, less machining is required and costly storage and maintenance of patterns is eliminated, saving production man hours.

Of particular advantage is the shop's ability to alter or modify welded designs at low cost to suit special customer needs. Since pattern changes are no longer involved, production is simpler and deliveries are faster than possible with former cast designs.

THE LINCOLN ELECTRIC COMPANY
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THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

ALL-WELDED DESIGN REDUCES COSTS CUTS MACHINING TIME

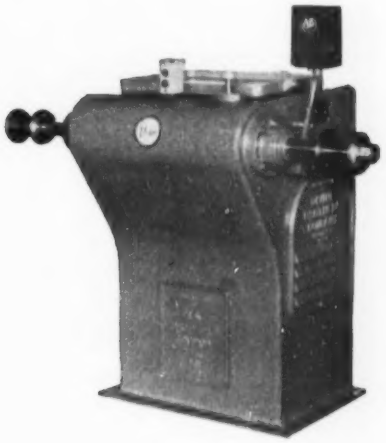


Fig. 1. All-welded construction *makes polishing and buffing lathe stronger, more rigid, yet cost of base has been cut from $107 to $86.*

REDUCES WEIGHT 15% SPEEDS PRODUCTION

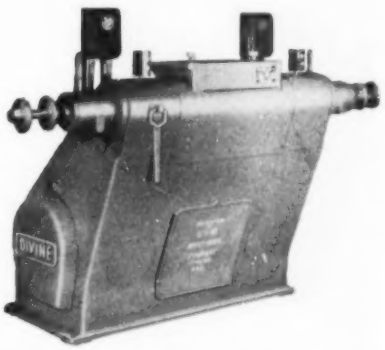
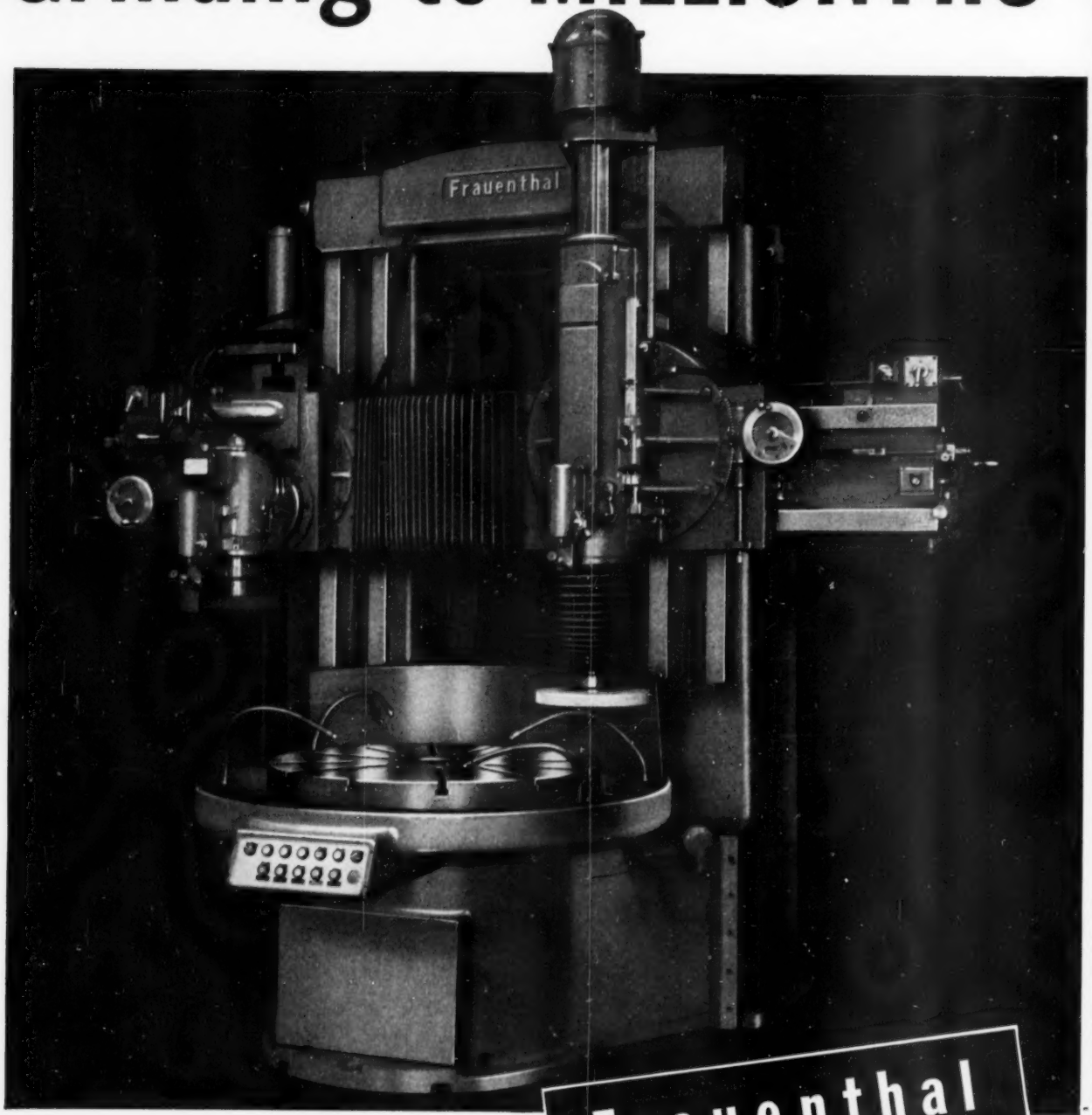


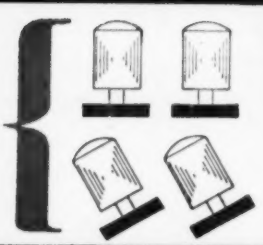
Fig. 2. Change to welded design *reduced weight of this lathe 328 pounds! Production no longer held up by delivery of castings.*

GET THE FACTS! Latest ideas for speeding conversions from cast iron to welded steel construction are presented in Lincoln Bulletin, "Elements of Weldesign". Available to designers and production engineers by writing on your letterhead to Dept. 2009.

Grinding to MILLIONTHS



Many combinations of spindle positions for simultaneous grinding on all sizes of Frauenthal Grinders



Frauenthal Grinders

MULTIPLE-HEAD SUPER-PRECISION VERTICAL

PRECISION-GRIND INSIDE, OUTSIDE AND FACES SIMULTANEOUSLY TO MILLIONTHS OF AN INCH!

# of an inch precision with Frauenthal Grinders

IMPOSSIBLE!...said one machine tool man

UNBELIEVABLE!...said another, skeptically

SHOW ME!...said a progressive executive

THIS is what we have shown many: You can get such super-precision grinding with these unique grinders that *the normal method of expressing tolerances in tenths-of-thousandths of an inch became inadequate* when precision was attained to *fractions of tenths-of-thousandths, expressed best in MILLIONTHS of an inch.*

AND THIS IS PERFORMANCE-PROOF...details on request

PRECISION GAUGE READINGS • CHART NO. 1

MAX. VAR. IN FACE THICKNESS (Parallelism)				MAX. VAR. IN WALL THICKNESS (Eccentricity)			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	7	.000000"	1	.000000"	7	+.000020"
2	+.000010"	8	+.000020"	2	+.000010"	8	+000010"
3	+.000030"	9	+.000030"	3	+.000020"	9	.000000"
4	+.000030"	10	+.000030"	4	+.000020"	10	−.000010"
5	+.000030"	11	+.000030"	5	+.000010"	11	−.000020"
6	+.000010"	12	+.000020"	6	+000020"	12	−.000010"

Maximum Variation in Parallelism: .000030" Maximum Variation in Eccentricity: .000040"

PRECISION GAUGE READINGS • CHART NO. 2

MAX. OUT-OF-ROUND ON O. D.				MAX. OUT-OF-ROUND ON I. D.			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	4	−.000050"	7	.000000"	10	−.000110"
2	−.000020"	5	−.000080"	8	.000000"	11	−.000070"
3	−.000040"	6	.000000"	9	−.000050"	12	.000000"

Maximum Variation, Outside Diam: .000080" Maximum Variation, Inside Diam: .000110"

What is YOUR grinding problem?

We'll be glad to work with you on difficult grinding, boring, turning problems. A wide variety of combination grinding of outside and inside diameters or faces can be made SIMULTANEOUSLY to assure utmost precision and unfailing interchangeability of parts. Adaptations for specific jobs also can be engineered into these grinders for high production at low cost.

TEN STANDARD SIZES conforming to essential J.I.C. specifications

SERIES	TABLE SIZES	MAXIMUM SWING
1800	30"	60"
	36"	60"
	42"	60"
	48"	60"
2000	60"	72"
	72"	88"
2200	110"	120"
	120"	130"
	130"	140"
	140"	150"

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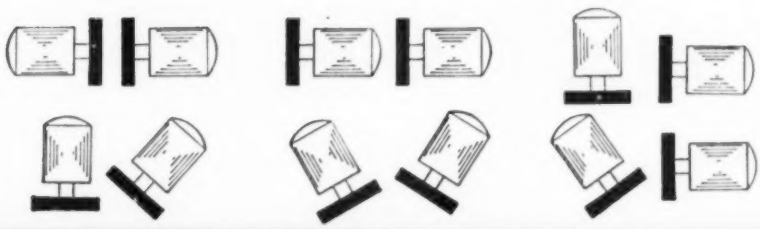
THE KAYDON ENGINEERING CORP. • MUSKEGON, MICHIGAN



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ELECTRO DYNAMIC
DIVISION OF GENERAL DYNAMICS CORPORATION
BAYONNE, NEW JERSEY

of supervisors and obtain the proper amount of responsibility from his own superiors.

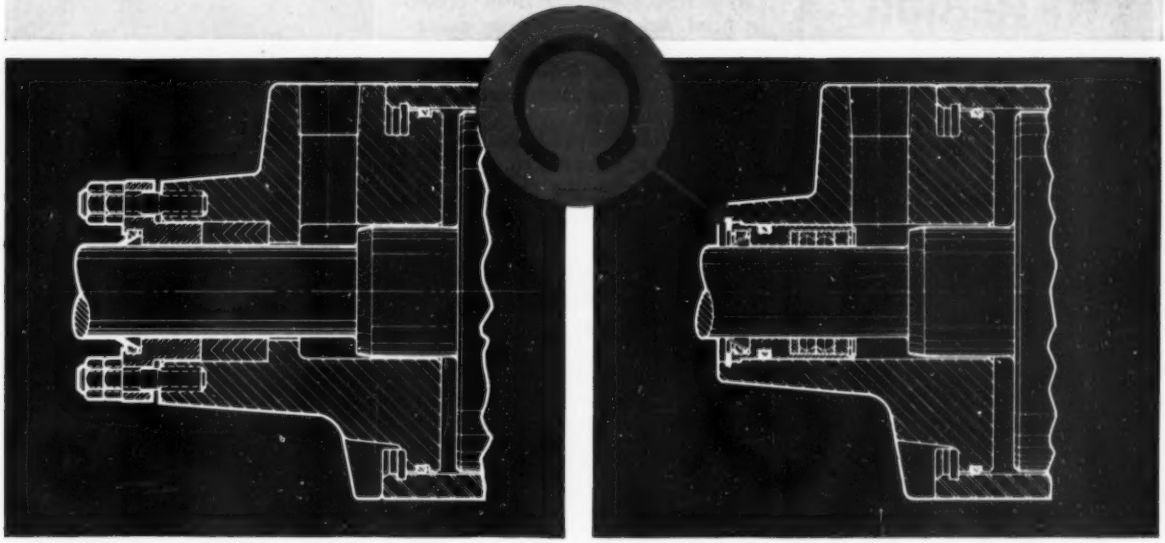
The safety engineer should function as a staff officer and should report directly to the head of the personnel department, who in turn reports to top management. He should be held directly responsible for all safety work and act as an expert adviser to operating executives. His duties should include: checking on safe practices and sanitary conditions and the need of various safeguards; educating foremen on the importance of safety and obtaining their cooperation; making recommendations regarding correction of unsafe conditions; examining specifications and drawings for new equipment and repairs to see that safety is properly provided for; supervising educational activities and meetings; investigating accidents and eliminating their causes; keeping records and preparing reports on accident experience.

The safety engineer should supplement his own work by a special committee organization. Among the committees which he will find helpful are the following: a general or central committee for organizational purposes composed of representatives of the various management and production departments; an inspection committee to make regular inspections of accident hazards, illumination, ventilation, sanitation, and safety in relation to maintenance; a fire committee to inspect fire hazards and equipment; a first-aid and sanitation committee in charge of medical and sanitation facilities; a publicity and educational committee to maintain bulletin boards and publicity, and to plan and direct all safety instruction and meetings; and an accident investigation committee to investigate and report on all serious accidents, their causes, and methods of future prevention.

The size and number of these committees, as well as the frequency of their meetings, will depend upon the needs of the organization. A good plan to create active interest is to change the personnel of the committees from time to time, say every three or four months, in order that a large number of employees may serve on them and gain an inside view of the safety effort.

Without the employment of a safety engineer to head up such work in a plant, it means that those in charge of production must be made responsible for the program. Supervisors and foremen must add to their regular responsibilities the organization and conduct of a safety program.

Waldes Truarc Ring Saves $2.84 Per Unit, Cuts Labor-Time and Materials in Hydraulic Packing Unit



OLD STYLE stuffing box required skilled worker to install packing rings one at a time, then adjust packing glands by trial and error. Disassembly was equally difficult, time-consuming and costly.

NEW Monopak Cartridge is smaller, lighter, streamlined and installed with one Truarc Retaining Ring. Disassembly and reassembly with new cartridge takes unskilled worker just 1 minute.

Hydraulic Accessories Company of Van Dyke, Michigan, uses a single Waldes Truarc Inverted Ring (internal series 5008) to hold Monopak Cartridge in cylinder head.

New design eliminates costly machining and saves 2⅛ lbs. of material. Re-design with Waldes Truarc Retaining Ring reduces stuffing box diameter from 3½" to 2⅞", and reduces length from 5⅞" to 4⅜". Allows savings in assembly, adjusting and testing.

NEW DESIGN USING WALDES TRUARC RING PERMITTED THESE SAVINGS PER UNIT

MACHINE TIME SAVED:	
Chucking, facing and boring	$ .72
Drilling and tapping 3 holes	.18
Drilling and counterboring 3 holes	.12
Assembling, adjusting, testing	.90
MATERIAL SAVED:	
1⅛ lbs. cast iron	.30
⅛ lb. bronze	.23
3 studs	.36
3 nuts	.03
TOTAL	**$2.84**

Waldes Truarc Retaining Rings are precision-engineered . . . quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again. There's a Waldes Truarc Ring to answer every fastening problem.

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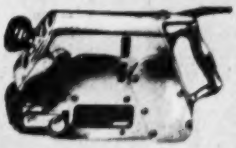

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REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

The weakness of this type of organization is that supervisors and foremen are apt to be occupied with other production problems and will find it difficult to acquire the special knowledge needed to achieve high safety standards in their departments. This may mean that too much of their safety knowledge will be gained from the accidents that occur. In brief, the principle to be recognized here is that "foresight is better than hindsight by a damn sight."

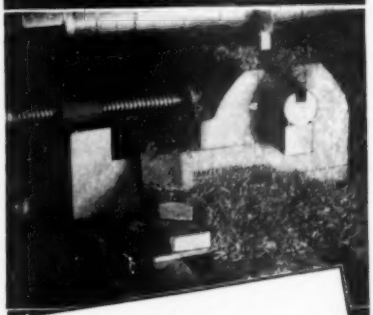
Some safety engineers have recommended the point - of - operation guarding of all machines. In my opinion, point-of-operation guarding should vary with the nature of the process. In the case of a lathe operated by a skilled toolmaker, covering the point-of-operation is not only impractical, but, as experience has shown, is unnecessary, principally because of the high degree of attention necessary when work is done at the operating point.

On the other hand, a production machine, used for repetitive operations and having an equivalent degree of hazard, requires a far higher degree of guarding. The type of guarding used on point-of-operation in repetitive work should be complete, that is, offering full protection to the operator against inattention or even a deliberate attempt to "beat the guard." Point - of - operation guards require the greatest use of ingenuity and discretion on the part of the safety engineer; otherwise, unnecessary over-guarding will only result in costly production slowdown.

Another point that is often overlooked is that the machine operator can also plan an important part in safety by making suggestions in regard to the improvement of the machine's safeguards and other safety features. He is in a particularly valuable position for observing the operation of his machine, and often can suggest safeguards that improve production and prevent accidents without slowing down the work. His assistance should be solicited through the suggestion system and by the foreman and safety engineer.

The installation of more guards or fixed guards often poses the problem of insuring adequate maintenance of the machine. Even though a machine has been properly equipped by the manufacturer with safety devices, it sometimes causes accidents because of a lack of adequate maintenance. Such failures cannot be attributed to poor design, since they have resulted because the user has not provided proper preventive maintenance. Here is a good field for the

"YANKEE" VISES



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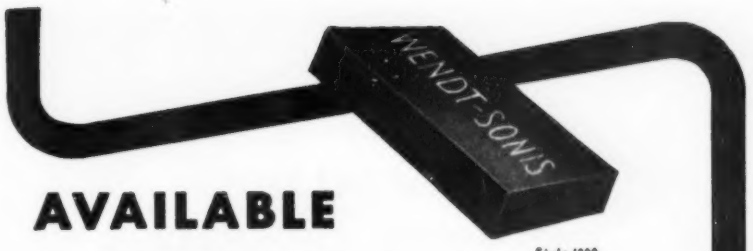
safety engineer to use his specialized knowledge and experience.

In my experience with industrial accidents, I have found that an accident is almost always a symptom of something wrong in the production process; something wrong with the man, the machinery, the method, or the materials. Practically all accidents are prima-facie evidence of defects in the working environment, of inefficiency in supervision, or of lack of adequate training of employees. Correction of these deficiencies prevents not only the occasional personal injury but the far more frequent near-accident, stoppage, or delay. This concept of safety therefore identifies accident prevention with sound business procedure.

The safety engineer's work is the logical focal point for starting plant safety off on the right foot. The prevention of accidents which result from lack of guarding, poor design, or other machine failure is an engineering matter, the one place in the safety program where typical engineering methods can be applied to best advantage and where, as has been repeatedly proved by many concerns with well-implemented safety programs, this type of accident can be reduced to the vanishing point. The capable safety engineer is more familiar with the engineering aspect of safety than the foreman.

A safety engineer's study should include analysis of the machine and operator. The analysis of each machine should involve determination of the velocity and force distributions and spatial travel of external parts. It should include the noting of all points to which access of the operator must be positively prevented. Such protection should be considered minimal, so that the operator, in the performance of his normal functions,

"He says he worked so hard all day setting up that job that he's darned if he's going home now and let some one else take the gravy . . ."



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The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

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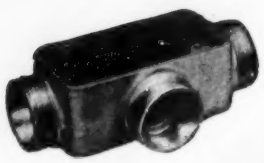

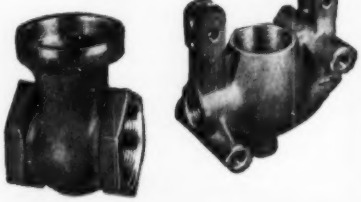

The examples of work shown here are typical of the wider variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

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and when unpredictably stimulated to perform spontaneous or instinctive motions or actions not required by the task, will not be subject to injurious contact. Included in this study should be the efficiency of the man for the work under varying conditions present, and his responses to color, vibration, temperature extremes or changes, illumination, noise levels, and other stimuli which may cause abnormal performance. It is fallacious to argue against putting guards on special machines because old hands are going to use the machines for special jobs. Special machines operated by old hands are just as much a hazard as production machines with regular guards in place.

Many a foreman feels that he should be the key man in any safety program. He argues that safety is part of production, and the foreman, as production head in his department, is the individual who directs employees, maintains equipment and is responsible for production. However, over a period of years, foremen have often been accused of disinterest and lack of cooperation in matters of accident prevention. This criticism is probably justified in some instances, but in many cases, it probably is lack of knowledge rather than lack of interest that handicaps the foreman.

The foreman does have the responsibility of working with the safety engineer and being guided by his decisions. Once the proper guards have been installed and safe methods have been put into operation, such guards must be kept in place and used, and adequate job instruction and training must be carried out so that the new, safer methods of doing the work will be practiced. The difficulty that the foreman will have in selling his workers on the use of such guards and methods will depend to a great extent on how he goes about doing it. If his workers have been consulted by the foreman and the safety engineer in getting their ideas, and beneficial suggestions have been used where practicable, the foreman will have less trouble at this stage.

Once new methods have been put into practice, constant follow-up and frequent inspections are needed to see that the measures taken are continued in use. The safety engineer is the best follow-up man in this connection.

Modern management is becoming increasingly aware that what is needed in accident reduction is a safety engineer with authority to go into any department and specify changes as necessary. Constructive

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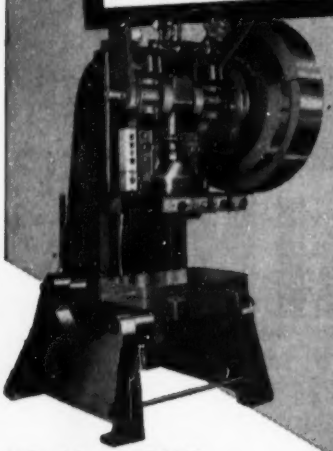

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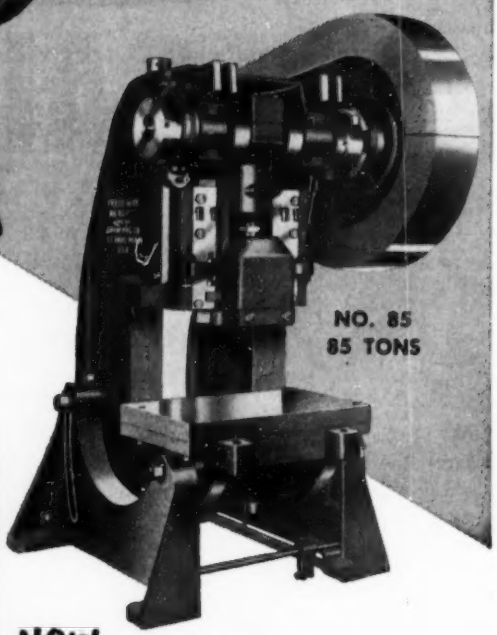

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safety thinking, unhampered by department budgets and foremen's opinions, is the answer to the safety problem.

Harry Kaufman
Philadelphia, Pa

THE RELATIVE MERITS of specialized safety engineering and psychological safety practice are dependent upon the effective influences governing the action and thoughts of the worker. The consistent aggressiveness of the person in charge of the one, and the apathy likely to obtain with the other, make it quite obvious that personal contact is the more effective in the long run.

Psychological safety, commonly known throughout industry as the influence-and-scare method, promoted with the aid of pertinent signs and cartoons is influential for the time. But like a good glass of cool, refreshing beer, it loses its soothing, mustache-beautifying froth and soon becomes repulsive to the taste.

Some years back—in fact when the idea of safety first came to the minds of the higher-ups—we were horrified by the safety posters, depicting various forms of mutilation, stuck up all around the shop ostensibly to prime us with liberal quantities of precaution. All they did was to make us sore as hell at the stupidity of the one responsible for the posting. It was my opinion at the time that such signs were promoting more harm than they were doing good.

Safety signs, when accompanied by good horse sense, become very effective. I had no sooner glanced over the latest issue when I pulled a boner and nearly lost my thumb. Safety signs couldn't have prevented my accident but horse sense would have. After the boss told me how I should have done the job so as not to get hurt, I decided I didn't use horse sense, nor did he use the sense of a jackass by permitting me to do what I did. A word or two of caution is all right in its place, but don't frustrate the worker's motivating system by having him continually walk on the brink of destruction.

Specialized safety would not do this. Specialized safety should be directed by a person possessing sound, common sense augmented by many years of practical experience. I think I am correct in saying that no book-made trouble-shooter should be entrusted with such an important mission as safety engineer. He should be well trained in sound shop-psychology—not the theoretical tripe one gets by listening to some square-head overburdened by degrees. He

should thoroughly understand human nature and gain the confidence of the men in the plant. It should be made plain to them that his mission is not to obstruct production, but to promote it by looking after the welfare of the workers.

The safety engineer should be open to any suggestion given to him by the men, as well as the supervisors. Ordinarily an inspector of any kind is looked upon with a certain amount of dread, and meets with disagreeable opposition at times. It is the safety man's job to conduct himself with such dignity and reserve, combined with wholesome friendliness, that he will soon override any opposition. He should command the respect and cooperation of every department head because his mission is to clear the way for them to perform their very best by eliminating the annoying things that interfere. I cannot conceive why any foreman should feel that the activities of a safety engineer on the job is an infringement of his domain.

The safety overseer should possess a sound understanding of what is necessary in the way of safety guards so as not to clutter up the shop with unnecessary "fences." I've seen safety inspectors so wrapped up in safety theory that they wouldn't hesitate in putting a guard around a vise because of the chances of a man getting his finger caught between the jaws.

The safety engineer should establish some stiff rules which, if violated, would be dealt with in such a manner that there would be no chance of the person repeating the offense. There is a great temptation

"Every winter I gotta run him up there to keep him warm while he eats!"

HOW DID THE *screw* GET ITS NAME?

The word "screw" is supposed to come from the Latin "scrofa" which has been defined as "a digger," from the habit of swine, who are fond of rooting up the earth with their noses. However, at least one man disagrees with the explanation. He figures that the etymologists have picked the wrong end of the pig. To him, the curly tail looks more like a screw than the nose does. Heads or tails, tradition has made the word part of the language.

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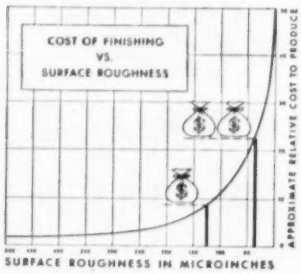

The chart shows how finishing affects the cost of machined parts. For example, if the surface finish is specified as 125 microinches and you are overfinishing to 32 microinches because of lack of proper gaging equipment, your finishing cost can be twice as much as necessary. To eliminate costly overfinishing, actual checks of machined surfaces should be made in the shop to be sure that specified values are met *but not exceeded.*

With surface finish control you can eliminate unnecessary operations and operate more efficiently. It helps you improve your products, since surface finish affects many factors in performance, such as break-in time, wear, heat transfer, lubrication, etc.

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THERE is now a simple method of measuring surface roughness on the production line so that the benefits of surface finish control can be realized. The Brush SURFINDICATOR* is a portable inspection tool . . . easy-to-use . . . accurate. This new instrument makes surface roughness measurement a practical shop operation.

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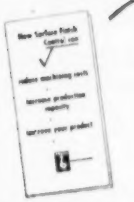

Get the complete story—get your copy of this new booklet on Surface Finish Control. It offers you the key to reduced machining costs, more efficient use of equipment, and improved products. Write Brush Electronics Company, Dept. U-11, 3405 Perkins Avenue, Cleveland 14, Ohio.

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for a person who is working on piecework, or who is pressed for time, to remove a guard in order to enable him to work with more rapidity. It is in just such instances that accidents occur. No matter how experienced a man is, there is always the chance of him making a slip-up.

There was an old fellow in our department who bragged of how experienced he was, and insisted that he could run any joiner without the aid, or hindrance, of a guard. Finally, in utter disgust (it happened that the old fellow was an important member of the staff, and a personal friend of the big shot) the safety inspector, rather dispirited, washed his hands of the whole affair. He did wrong; he should have stood his ground and insisted that the machine be equipped with the proper guard. Several months after the investigation the old fellow was running the machine without the guard and the inevitable happened. Poor old Tom lost three fingers and a portion of his hand. This only goes to show that experience counts for nothing when it comes to safety; actually it gives a man too much confidence in himself.

We cannot look upon the safety supervisor as an unnecessary addition to overhead, because he is as necessary as the roof over the shop; he keeps production at its highest by his contribution to the general welfare and efficiency. He should be a part of management and not confined to the narrow limits of any department. His authority should be such that his recommendations carry considerable weight regardless of to whom he makes them.

There is no use in establishing uniform periods of inspection because man, as a rule, will conduct himself with deceptive conduct at times and, as in this case, would on many an occasion replace a secretly-removed guard when he thought the inspector was likely to show up. We can give a jackass credit for using horse sense, but when a man acts like a jackass we critize him no end.

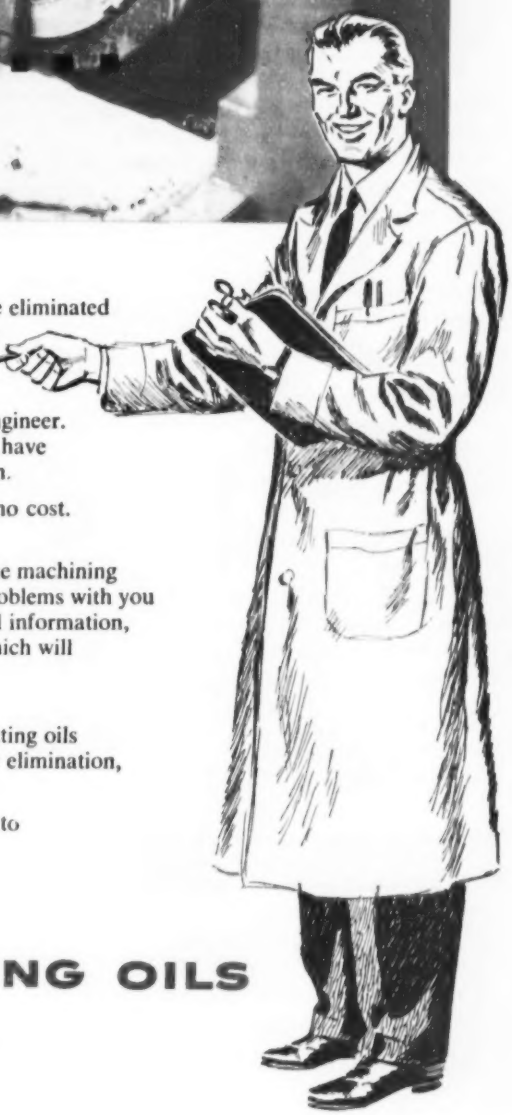
John Homewood
Tujunga, Calif

WHEN IS A TOOLMAKER?

Is it justifiable to promote a machinist to toolmaker if the man has never served a formal apprenticeship? If he proves equal to the job, shouldn't his lack of apprenticeship be overlooked in favor of ability?

"WHEN IS A TOOLMAKER," like all of your subjects, is good for argument and study, as the question might be

Let an Expert solve your Cutting Oil Problem...



Hundreds of machine shops, large and small, have eliminated the *chance of error* in selecting the correct cutting fluids for their varied operations.

They solved this common (and often costly) problem with the help of a Sinclair Lubrication Engineer. And by using the right oil for each operation they have improved work quality and stepped up production.

The same expert service is available to you – at no cost. Here's how it works.

Call in a Sinclair Lubrication Engineer to study the machining operations in your shop. He will discuss cutting problems with you and your production personnel. After gathering all information, he will prepare a comprehensive, detailed chart which will guide you quickly to the correct cutting oil for any particular operation.

In addition, he will brief your personnel about cutting oils and coolants – storage, mixing, application, waste elimination, sanitation, etc.

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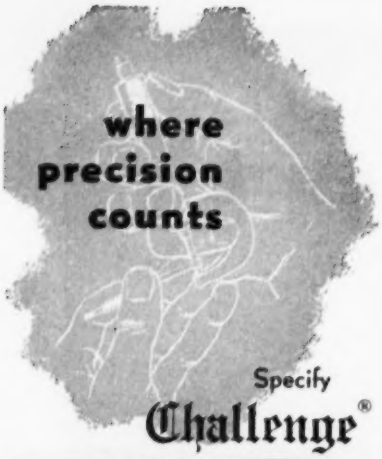

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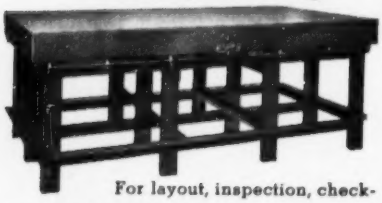

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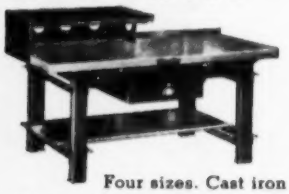

Four sizes. Cast iron top, two inches thick. Welded steel supports, tool box shelf, steel drawer with lock. ***Challenge Utility Benches*** — low cost.

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applied to "when is a foreman or superintendent," each more or less in the same group for discussion.

First of all we are all more or less jealous, not only of our jobs, but also envious of the other fellow, for when we understand he has been given a chance at an opening we begin to feel why should *he* have it instead of us.

Our theory has always been to make the best of our jobs and always look forward to the one a bit higher or more responsible than the present one, and to work towards that goal. In this present age, there seems to be a sentiment against such practices with the result there is more or less dissatisfaction among men because they don't get ahead.

To be on the watch for a better job or greater responsibility will be rewarded sooner or later; possibly not as soon as expected, but then we may not always be ready at the time for the call, unless we are more or less seasoned.

We read in our local paper every day of baseball scouts on the lookout for newer and up-coming players, and if the owners of baseball teams are on the lookout for better players, doesn't it sound reasonable that other business men should be on the lookout for better toolmakers, foremen, or superintendents?

One interested in his work should let his boss know he is anxious for a change for the better when an opportunity presents itself. One thing to bear in mind—if we don't look out for ourselves, who can we depend upon to do it for us?

We have never heard of the head of any plant who wasn't looking for better men, better ideas, and better working conditions; by the same token we have learned the boss generally knows what is going on in the plant and by whom. So we suggest: Make good where you are, make your wishes known and do not get discouraged if the plum doesn't fall immediately; but whatever happens, do not let the boss down.

Keep looking ahead; your toolmaker job will be yours before you know it, without doubt with some ridicule or heckling, but that will pay in the end if you do not let it get your down.

P T Hendricks
Grand Rapids, Mich

AN APPRENTICESHIP IS something to show you have served your time in your chosen profession. It is not, however, a guarantee that you are a better man than a toolmaker who has learned his trade in various shops and in various ways.

It requires more than an apprenticeship to prove you are an efficient and skilled toolmaker. If your training has been half-hearted, with no aim or goal, you will not be a success regardless of the apprentice papers.

On the other hand, we have the eager beaver or spark-plug type with a burning desire to learn. This type usually learns all there is to know about the various skills required in the toolroom. I know of several fellows who have apprentice papers who spent half of their apprenticeship in oiling and greasing machinery, running errands, sweeping the floor, and taking the absentees' place in production. This is all very well when the need arises, but too often it is used to extremes. A fellow cannot learn his trade sweeping the floor or running an elevator.

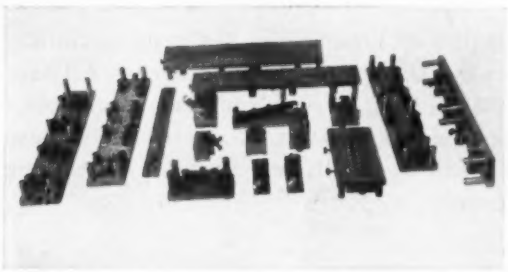
There are many fine toolmakers who have apprentice papers. There

"It's a good thing I was kicked out of college, or I'd be in there with you guys making ten dollars less."

YOU GET *SPEED* PLUS ACCURACY WITH MOORE JIG BORERS

IN THE TOOLROOM

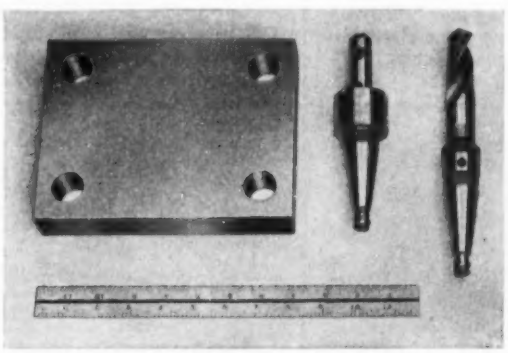
400 holes to "tenths"—5 to 7 minutes each on the No. 1 Moore Jig Borer



Manufacture of this group of drill jigs involves accurately locating, drilling and boring approximately 400 holes. The No. 1 Moore Jig Borer finished them to "tenths" in from five to seven minutes per hole.

ON PRODUCTION

64 holes to ±.0002"—2 minutes each on the No. 2 Moore Jig Borer



Sixteen pieces like this were located, drilled, bored and checked on a No. 2 Moore Jig Borer with one drill and one carbide bit. The 64 holes were finished in 2 hours and 8 minutes (plus 30 minutes setup) with location and size tolerances ± .0002".

Only a precision machine geared to the high American production standards of ruggedness *and* accuracy can meet these performance requirements. For versatility and speed in spotting, drilling, reaming, boring and checking operations in production as well as tooling, no other moderately-priced machine tool compares with the Moore Jig Borer. And there's no sacrifice of accuracy for speed, since the lead screw measuring system built into each Moore machine permits working to the closest of tolerances.

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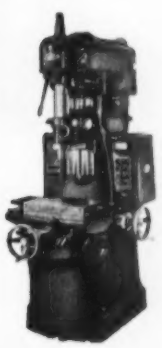

NO. 2 MOORE JIG BORER
Table working surface of 10"x19". Heavier cuts, larger holes. Features infinitely variable spindle speeds, three power feed ratios, centralized control panel.

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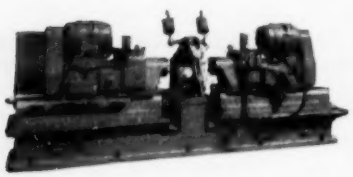
see our catalog in MACHINE TOOL CATALOGS or write for copy

10 solutions

TO DIVERSE PRODUCTION PROBLEMS WITH

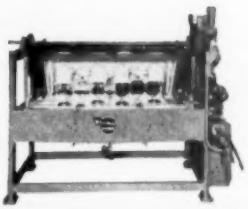
W. F. & JOHN BARNES SPECIAL MACHINES AND EQUIPMENT

The 10 examples shown here are typical of the broad range of special machinery and allied equipment that are today designed and built at W. F. & John Barnes. All have been especially engineered to meet a specific production problem. Each represents a profitable solution to the problem of saving time and cutting costs. Collectively, these machines present tangible evidence of the coordinated skills and versatility of machine building experience available to you at Barnes.



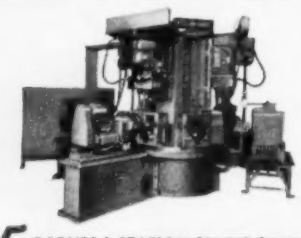
1 TWO-WAY HORIZONTAL BORING MACHINE — rough bores and chamfers automobile transmission cases at 82.5 pieces per hour (80%). This unit completes 18 operations.

2 BARNES SPECIAL MACHINE — drills and counter-sinks Tractor Spindle Extensions. Performs ten operations with pieces completed at the rate of 19.5 per hour (80%). Center head has 4-spindle cluster arranged for pivoting to provide adjustable spindle pattern.



3 SPECIAL SEMI-AUTOMATIC TESTING MACHINE — developed to test for leaks in automotive power steering castings. Four castings are inspected with each machine cycle. Workpieces are loaded and unloaded manually . . . all other operations are performed automatically.

4 AUTOMATIC RETORT LOADING MACHINE — one of a variety of special equipment, such as glass handling machines, can unloaders, carton uncasers, and special conveyors, designed and built by Barnes for the food, chemical, and beverage industries.



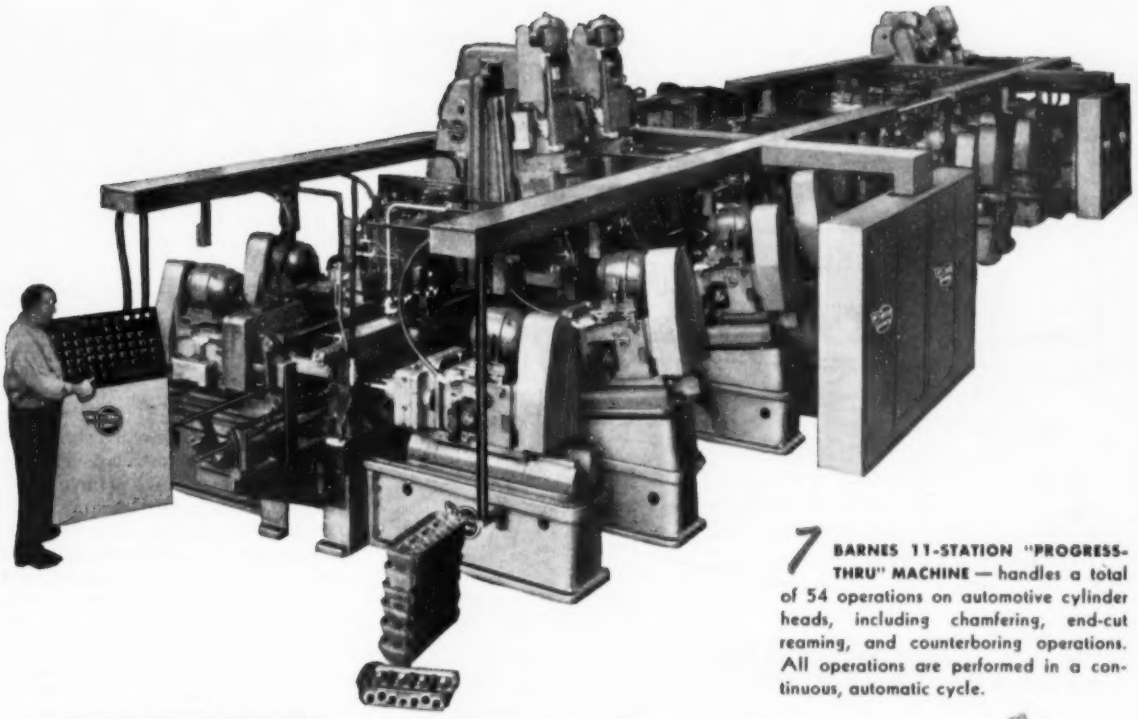
5 BARNES 6-STATION CENTER COLUMN MACHINE — with 72" diameter indexing table, completes 18 operations per piece, 118 pieces per hour, on Cast Aluminum Transmission Extension Housings in a large automotive plant.

6 SPECIAL VERTICAL SINGLE-SPINDLE MILLING MACHINE — with 72" saddle, slab and face mills mounting pads on a variety of motor frames. Quick setup features enable 6½ pieces to be completed per hour.

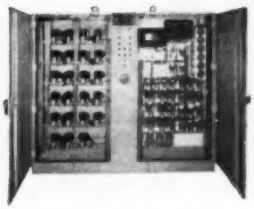
W. F. & JOHN BARNES

BUILDERS OF BETTER MACHINES SINCE 1879

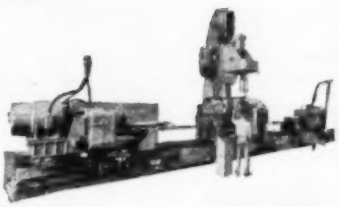
MULTIPLE SPINDLE DRILLING • BORING • TAPPING



7 **BARNES 11-STATION "PROGRESS-THRU" MACHINE** — handles a total of 54 operations on automotive cylinder heads, including chamfering, end-cut reaming, and counterboring operations. All operations are performed in a continuous, automatic cycle.



8 **ELECTRICAL CONTROL PANEL** — automatically controls regeneration and service operations on two sets of deionizing tanks, alternating units for a constant supply of treated water . . . one of countless applications where Barnes Electrical Controls add efficiency and economy to everyday industrial operations.



9 **SPECIAL TWO-WAY VERTICAL AND HORIZONTAL BORING MACHINE** — rough, semi-finish, and finish-bores, chamfers, and faces Final Drive Housings. Spindles automatically change speeds and feeds to meet boring and facing requirements.

10 **APRON-TYPE CONVEYOR** — especially designed for efficient removal of chips from machines used in a large automotive plant. Barnes Conveyors have been designed and built for a wide variety of applications.

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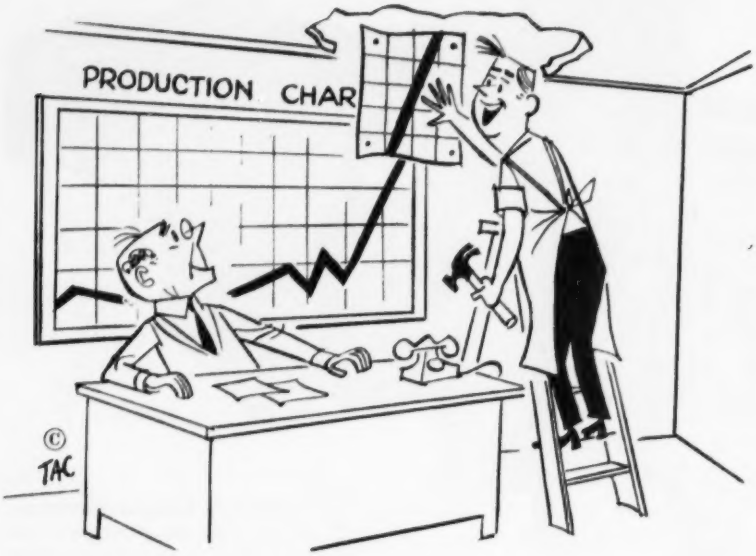
MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES



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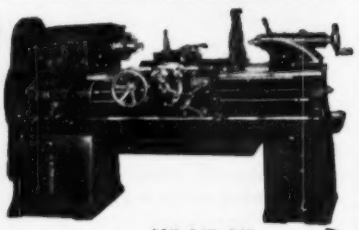

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Precision Since 1840

are also many fine toolmakers who never served an apprenticeship. That's what makes employment managers. In this case we have an employee who is admittedly good, yet one foreman wants to hold up promotion because he does not have apprentice papers. This despite the fact he has already proved he has the necessary skill to do the job. "You can't hold a good man down" still holds good today.

A E Salmons
Philadelphia, Pa

LET US FAIRLY and squarely face the fact that we have today very, very few toolmakers who have served full apprenticeship training. Before World War II the practice was to train men to become toolmakers. We had long training programs, and the young fellows just out of trade schools were willing to work at a moderate wage in order to learn a trade. The war changed this and many other ways of living. We suddenly found ourselves without enough toolmakers or with men who were partly trained. They demanded and got more money and became toolmakers by name. Some of them were tops and others were only passing fair. Yet they drew down the money of the toolmaker. So we created a condition in which we now must live.

Some companies still run apprentice training programs, but the takers of these programs are very small because the money is poor. A man can earn more at other plants or in other fields, so he is unwilling to serve five or ten years as an apprentice. We live in a world of speed. We must face that fact in studying problems of help. It appears at least that what took five years before World War II now must be completed in one or two years. The wage increases must keep up with the increase in speed of living.

There is a difference between a good machinist and a top-rate toolmaker—a span of many years of experience. Also there is a wide gap between a young apprentice who has just served his time and a top-ranking toolmaker. True, the apprentice has worked on tools and has been trained in the art, but the fundamental principles of machining, the use of hand tools and the skill of shaping metal is basic with both the machinist and the young apprentice. Now a good machinist while not knowing a thing about the overall production of complex tools and dies, does have the basic principles. He

can read blueprints. He has had to work to close tolerances and he knows how to cut metal. So without too much loss of time he can adapt himself to thinking in terms of the overall tool instead of just one small part.

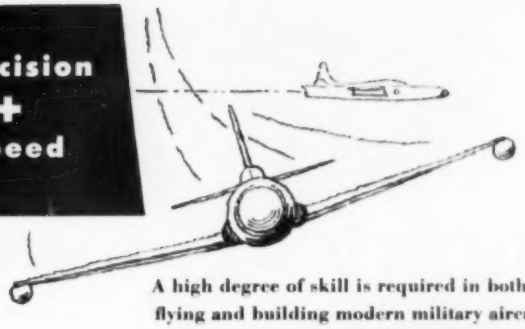
Since toolmakers have been very difficult to obtain, some companies have resorted to this plan. The work on a die or a tool is broken up into various parts. The tool is built on a production basis rather than by one individual. The machinists make certain parts to blueprints and all these various parts come together and are fitted and blended into the finished tool by a toolmaker. This saves hours of labor and reduces costs of operation. Yes, it requires planning by the foreman and it tends to build up specialists on certain machines. However, it is an answer and it works. More and more companies are adopting this procedure.

But should we place a machinist in a toolmaker's job? The answer is yes, if the man is capable of comprehending the overall work. If the selection is made wisely by the foreman, then success can be expected. The machinist must have been working as such for a number of years and be familiar with all types of machine tools. He must be able to think for himself and to know how to accomplish what is shown on a blueprint. This he should have learned in becoming a machinist.

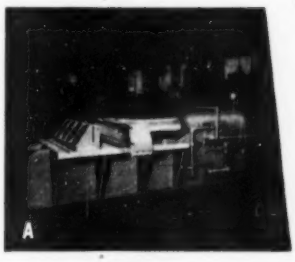
If a definite company policy is established regarding the advancements from machinist to toolmaker, then no problem will arise to create a feeling as indicated by Ed's remarks. Clearcut plans of advancement and the following of such plans by all, helps to keep harmony in any plant. Don't put something over on

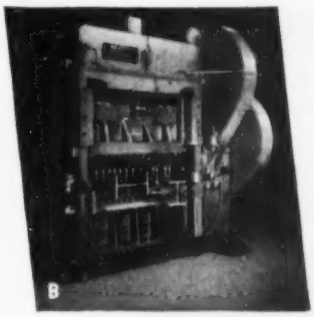
"He's mad because the chips are so big. Says they're hard to sweep."

precision + speed



A high degree of skill is required in both flying and building modern military aircraft. BEATTY machines, like the latest of the supersonic jet jobs, are precision-built to afford maximum accuracy and speed in metal frabicating operations. Let a BEATTY engineer analyse your industrial machine needs—if one of the machines shown doesn't answer your production problem, we'll design and build one to your exact requirements.





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C. BEATTY Spacing Table handles web and flange punching without roll adjustment.

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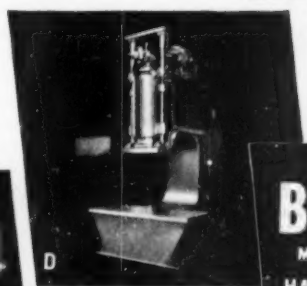

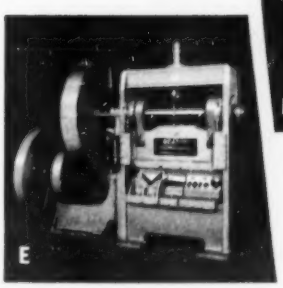

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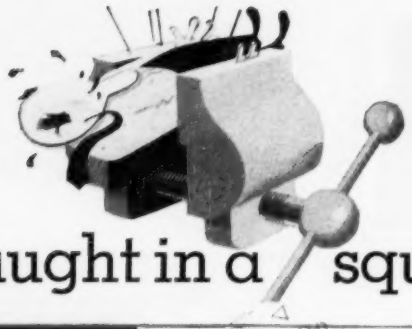
MACHINE & MFG. CO.
HAMMOND, INDIANA



Caught in a squeeze?

with High Cost PRODUCTION Problems Involving . . .

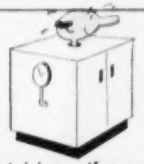
Variety of sizes, shapes, materials . . .

Changes in consistency . . .

Heating, baking, drying, cooking . . .

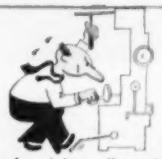
Cooling or chilling . . .

Maintaining uniform tension on increasing or decreasing diameters on any web type of material . . .



Maintaining uniform pressure, weight, temperature or other variables . . .

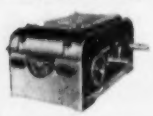
Regulating conveyor speeds . . .



Synchronizing all working parts of one machine or machines working in series . . .

Cut production costs with **REEVES** SPEED CONTROL

● With overhead and sales costs soaring daily, there's bound to be a squeeze—and you, the manufacturer, are caught right in the middle! Greater efficiency and lower production costs are the only effective means of combatting these rising costs. Act now—Let REEVES *stepless*, variable speed control give your machines greater work range, accuracy and efficiency . . . simply with the touch of a button or the turn of a handwheel. Choose today from the complete REEVES line—now standard equipment on more than 2750 different makes of machines! Write for 132 page catalog. Specify Dept. A-102a-G.



Variable Speed Transmission: provides speed flexibility over 2:1 to 16:1 range. Fractional to 87 hp. Heavy duty applications.

Vari-Speed Motor Pulley: converts any constant speed motor to a variable speed drive. 4:1 speed ratio. Sizes to 10 hp.

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REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Variable Speed Control

a person—it always backfires. When you have made a transfer, don't just leave the fellow to the mercy of the others. Help him get started by working with him. Assign men with him on dual jobs, until he gets his feet on the ground. It is new. So it would be if you hired a new toolmaker. Always remember in transfers to guide the worker until he is on his way on the right track.

Charles D Townsend
West Hartford, Conn

ED APPARENTLY IS still thinking in the Middle Ages where it was taught that the only way anyone could learn a trade or business properly was by the so-called apprenticeship system. This really was a subtle scheme to keep the various trades in the control of a few for their gross profit.

The apprenticeship system was started about the year 1283 and was then part of a plan to throttle competition. By 1437 this restrictive practice had become so obnoxious that a serious attempt was made to enact a statute to abolish this restriction on the freedom to work.

It is fortunate indeed that this binding of youths to several years' of work under a master, who may or may not be competent to teach his charge a trade, is rapidly dying out in spite of frantic efforts in some trades to maintain it. It is a good thing that it is, for if it could have been legally enforced, then Sir Joseph Whitworth, who was the founder of precision work, would have been compelled to remain a cotton-spinner, for that was the trade in which he served his four-year apprenticeship; also, W G Armstrong (Lord) would have been restricted to the occupation of a solicitor and the firm of Armstrong Whitworth & Company could never have come into existence.

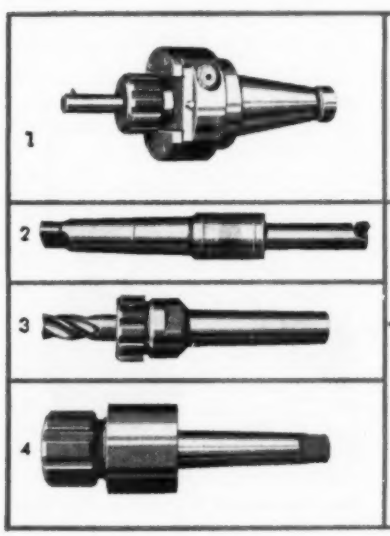
When a young man has served his apprenticeship at some trade, this is in no way proof that he now is an expert in that line of skill, and it is just plain foolishness to think so. If it were so, then to get another Steinmetz all that would have to be done would be to take a youth, any youth, and apprentice him to any electrical firm and in four years or so, a second Steinmetz would be developed. We could even have a thousand Steinmetzes and thus put the USA on top of all possible electrical developments.

Al picked Judson for a toolmaker because Judson had proved he was the kind of man who probably would become a top toolmaker, who had trained himself to excel in precision work, and therefore was entitled to

UNIVERSAL "KWIK-SWITCH" TOOL HOLDER PERMITS TOOL CHANGES IN *10 SECONDS!*

Universal "Kwik-Switch" Tool Holders permit rapid tool changes for operations such as drilling, reaming, and boring on mills, radial drills, while maintaining accuracy and rigidity. Each tool is inserted in its Adapter Chuck and set to proper length and tightened. The Adapter Chuck is then easily locked or unlocked by hand in the Master Chuck by less than a quarter turn. Made of hardened and ground steel, and precision manufactured throughout. Available in straight and taper shanks to fit all machine tools. For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or our home office.

177



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(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
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HANCHETT *for all metal cutting*

Metal Saw Sharpeners

(Hot and Cold Saws)

Two Views of High and Low Toothed Metal Cutting Saws.

For Automatic Grinding of Cold Metal Saws.
Rigid — Accurate — Fast.
Ball Bearing Mounted Head Slides.
Heavy Duty Construction Throughout.

For inserted tooth, segmental type, solid tooth circular saws made in three sizes — Models 1130, 1160, 1172. Saw capacities 8 to 72 inches and larger.

Other Models — *Hot* and *Cold* Saws, No. 12 and No. 572 (all sizes).

COVEL SAW SHARPENERS HANCHETT KNIFE GRINDERS

HANCHETT MANUFACTURING COMPANY

World's Largest Manufacturers of Shear Blade, Knife and Saw Grinding Machinery

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MORE FLEXIBILITY IN YOUR SHOP

Harden, heat treat, temper and anneal with one furnace . . the Johnson No. 706.

Another in the Johnson line of dependable gas equipment has won its place in both large and small shops and plants. Operators like its easy adaptability. Six Johnson Direct Jet Bunsen Burners with individual shut off valves and pilot lights provide steady, easily controlled heat from 300 to 1850° F. Semi-muffled type with burners operating below Carbofrax hearth. Firebox: 7"x 13"x 16½". Also available bench style. Write for complete and factual information.

A smaller version of this highly flexible furnace is the No. 654. Four burners deliver 300 to 1800° F. Firebox: 5" x 7¾" x 13½". Available as pedestal or bench style.

JOHNSON GAS APPLIANCE CO.
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Johnson No. 706 Pedestal Style	$300.00
Bench Style	$275.00
Johnson No. 654 Pedestal Style	$163.00
Bench Style	$138.00

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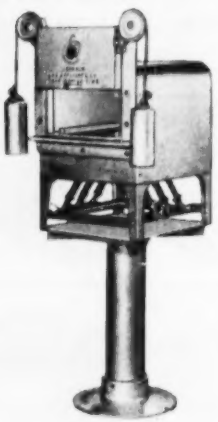

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INDUSTRIAL GAS EQUIPMENT

Furnaces • Burners • Torches • Valves • Mixers • Blowers

have the advanced job which he could handle. To compel him to stay as a machinist when he was capable of much higher precision work would have been as idiotic as compelling George Washington to remain a small town surveyor when he was capable of steering a young nation towards becoming the most progressive nation the world has ever seen.

All attempts to date to compel men to follow a narrow path laid out for them by emperors, politicians, society, or trade unions has resulted in failure, for ultimately men come along who are determined to live their own life by their own merits and hold their position in business or society by their own judgment and skill.

Al should be commended for giving Judson the opportunity to show how capable he is, and it should be noted that Al did not act until he had carefully considered Judson's record and his past performances.

George P Pearce
Albuquerque, NM

YES, I THINK qualified personnel should be used as toolmakers.

The objection posed by the article is a personnel rather than technical objection (toolroom strike). As in all such personnel problems, effort should be made to anticipate and offset trouble before it happens. In this case, the people who approve transfers and are also aware of personnel relations, should have cleared this possible feeling in the toolroom so that Judson would be received without friction.

This type of thing comes under one general rule: "Always make known any change to everyone involved or affected before the change is made." Nearly everyone presents either active or passive resistance to

"Dad, I've worked in the shop three weeks now! How about promoting me to foreman!"

any change that comes as a surprise.

Every man is proud of his own ideas, and proper presentation can make him adopt the change as his very own. Where it is anticipated that a person or group will present a strong opposition to a change, this tactic should be attempted.

Sheldon Meyers
Massapequa, NY

THERE ARE VARIOUS grades of toolmakers, capable of doing many different jobs in industry, but a general definition would be that of a tradesman who earns his livelihood using metal-cutting machines to produce a given tool; he often designs the tool, even to specifying types of steel to use. By tool is meant a production, measuring, or metal-working device. The tradesman gains his knowledge by actual experience, one way or another, supplemented by book study.

This definition doesn't say anything about serving time as an apprentice to learn toolmaking simply because this type of learning is not absolutely essential to learn the trade. The real advantage in serving time is in being paid while learning and in the certificate received on completion of the course.

Some, such as Al, will insist that only an apprenticeship training can make a toolmaker. But investigation will prove that those who assert this, served time themselves and want this type of training placed on a preferential basis to preserve the prestige and immediate recognition that it is supposed to give. The advocates of this type of training for toolmakers have even discriminated against trade-school graduates of machinist training courses, sometimes perhaps for selfish reasons.

Apprentices are a source of low-cost labor. I have met up with my share of this opposition, ie, a refusal to hire because trade-school training was inadequate. Only wartime conditions and the resulting scarcity of labor overcame this prejudice. Because of this manpower shortage I was able to move around and build up my background of experience. I didn't serve time in an apprenticeship program, but no one challenges my ability or status as a toolmaker.

I have seen all kinds of toolmakers; even serving time does not produce standard ability. After completing the period of training, some are good, some are indifferent. Suppose a toolroom machine operator wants to get ahead, and he thinks he wants to become a toolmaker. If he has to earn while learning, and

Boye & Emmes standard headstock, with cover removed, showing constant mesh, wide face gears and large diameter, positive jaw, sliding clutches.

THE LATHE CAME BACK*
-After 25 Years-

HEADSTOCK GEARING
"GOOD AS NEW"

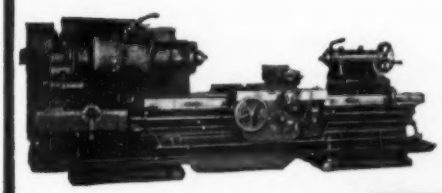
Boye & Emmes Engine Lathe No. 300-141, owned by The Timken Roller Bearing Company, Canton, Ohio, was returned for factory inspection after twenty-five years of day-in-day-out use. During this period, Timken purchased repair parts from us, for this machine, to the extent of $154.15. Yet, when the headstock cover was removed at the factory the gearing was found to be "as good as new." This is usual.

CONSTANT MESH GEARS
POSITIVE JAW SLIDING CLUTCHES
SPELL OUT THE ANSWER

The principle of power transmission which is used in Boye & Emmes Engine Lathes incorporates constant mesh headstock gearing, with speed changes effected through positive jaw, sliding clutches. This construction eliminates gear wear due to shifting action, allows shorter shafts, less space between bearings, and hence more accurate and rigid construction.

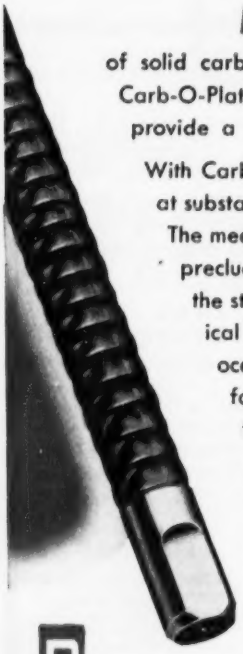
FREE LITERATURE

If you are not now using Boye & Emmes Long Life Engine Lathes, investigate. Compare this lathe of low maintenance and high accuracy from every viewpoint. Specifications and details of construction for all sizes are contained in our free Bulletin No. 601. Write for it today!



*One of many documented cases of "no wear" in Boye & Emmes constant mesh lathe headstock, after years of use.

LONG LIFE LATHES
BOYE & EMMES
MACHINE TOOL COMPANY
135 CALDWELL DRIVE
CINCINNATI 16, OHIO



Many gages, parts and tools normally produced of solid carbide can now be made with a steel base and Carb-O-Plated—a method which employs the Linde process to provide a thin wear-resistant coating of tungsten carbide.

With Carb-O-Plating you get the wear life of carbide but at substantially lower cost than if the solid material is used. The mechanical bond between the coating and steel base precludes change in properties or warping. Because of the steel base, the products have resistance to mechanical shock and are not subject to breakage as can occur with sintered carbide. In addition, when used for gages, Carb-O-Plating increases accuracy since thermal expansion and contraction is identical to the steel part being gaged.

Many of the country's foremost manufacturers are now benefiting from the use of Lincoln Park's Carb-O-Plated products. Why not investigate the application of this new process to your wear-resistant parts.

THE PLUS IN PRECISION

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DESIGNERS AND MANUFACTURERS OF: SPECIAL AND STANDARD CARBIDE CHROME PLATED AND STEEL GAGES CARBIDE ROTARY FILES • ALSO FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION

can't get into apprentice training for some reason or other, what can he do but get his experience at small shops, preferably job shops, and build up his experience. Why, even the man just finished serving time is advised to go out and get more experience than what was picked up at the home plant.

A toolmaker has arrived when he has experience behind him. Why be technical about how he got it? It can usually be assumed that the last firm he worked for recognized his increasing experience and ability, and rated him accordingly, if the rating system is impartial and honest. Upgrading proceeds from machinist, various proficiencies of this grade, to "B" man, and finally to "A" man, it is hoped.

Machinists have been promoted to toolmakers on recognized ability and also because of a desire to raise the personnel standards of the toolroom, eliminating the machinist grade, such as where I am employed.

Edward Diskavich
Torrington, Conn

WHENEVER A CHAP can hold down the job and do the work, that, brothers, is a toolmaker.

Forty years ago we had no radios or television sets; today we have both. Forty years ago, there was a definite caste system existing in most machine shops. A machinist helper made more money than an apprentice machinist, but he was not permitted to run a lathe, or do any other skilled work; today that has all been changed.

I remember a shop where steam-crane clam-shell buckets and orange-peel buckets were in the shop continually for repairs. The work was hard, dirty, rough, and disagreeable in any man's language. In this particular shop there was a floor crew of four machinists who handled all floor assembly and repair work. If the floor crew was tied up when a bucket came in for repairs, the boss had to pull men off the bench or machines to do the job. Men who spend a lifetime running lathes and boring mills seldom have a hankering for a dirty floor job; in this particular case the machine men resented it bitterly. The boss knew all about this feeling, so he selected a husky helper and trained him to handle all bucket repairs. That system was just ducky until the union shop committee got to thinking about it, and they announced the union's objection to the boss in these words: "No helper handles a wrench," they stated, "unless a machinist is present and bossing the job."

ANOTHER NEW FAFNIR...

Ball Bearing "Economy Package"

Type PB
Pressed Steel
Pillow Block

The new Type PB Series Pillow Block is developed to fill a specific need for a high-quality, precision ball bearing unit at the lowest possible cost. It is made for *light duty* applications where a low-cost "packaged" unit offers definite manufacturing and servicing advantages . . . on agricultural equipment, conveyors, light-duty fans and similar types of machinery involving the transmission of power.

The Type PB Series Pillow Block opens up new opportunities to add extra product sales features and to lower maintenance costs . . . another example of the Fafnir "attitude and aptitude". Send for new, descriptive bulletin. The Fafnir Bearing Company, New Britain, Conn.

OUTSTANDING FEATURES

- Low Cost
- Precision Ball Bearing . . . Fafnir Wide Inner Ring Bearing* with Self-locking Collar and efficient Plya-Seals.
- Two-piece separable pressed-steel housing.
- Self-aligning . . . unrestricted in all directions at assembly.
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- Only two bolt holes required in assembly.
- Ample capacity for radial, thrust or combined loads.
- Pre-lubricated with long-life grease.
- Available for shaft sizes ½" to 1¼" inclusive.

*Easiest bearing of all to install. Counterbored, eccentric, mated cam construction of collar and inner ring assures positive locking action without set screws, lock nuts or adapters.

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One of America's largest and most famous mass-producers recently chose Ames as preferred source of supply for indicator gauges.

The reasons behind this decision are the very reasons why *you* should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive,* low in friction, yet are *rugged* and *tough*—give *more* on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.

Ames Dial Depth Gauge No. 11C

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Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

Let me mention that forty years ago the boss was the boss! He could fire you—and quick. Now this boss was very unhappy about the whole thing, but he handled the matter in what I consider a top-chop manner. He promptly took the helper off the job and just as promptly put the shop committee on. By the end of one day, the committee was so sick of and fed up with their new job that they reconvened; and then they came back to the boss and reported that the union had reviewed their original decision and had repealed it. They were now of the opinion that there was nothing objectionable to the honorable union in the practice of using helpers for certain classes of work, and, in fact, they no longer considered bucket repairs to be journeyman-machinist work. So the boss very gravely removed them from the job and put the helper back on.

Now I personally have served an apprenticeship—and a tough apprenticeship too, at the machinist trade. I was trained on the fact that a helper was a necessary evil, but that he was a helper and would be one all his life. Several wars, a couple of colleges, and forty years of time have revised my original ideas. I have seen smart boys spend one year in a manual-training school, and come out and do better and faster work on machines then mechanics with an apprenticeship and fifteen years' experience to their credit can do.

When a war is on, union rules and practices are shoved aside. Women and boys are trained to run machines, and they do a good job of it. I realize now that the old belief that only an apprenticeship can qualify a man to perform certain classes of work is merely union propaganda directed toward one end—protect the job. Understand, I still am very

"We'll carry on with the estimates as soon as I return from the abrasive department. The missus wants her bread knife sharpened . . ."

Double Diamond GEARS are built...

. . . to produce low installed cost

. . . to serve economically and dependably on the job for which you buy them

. . . and to do credit to your product and your reputation

The above quotation appears in the introduction of our new 40-page reference book which fully describes the ten types of gears in which we specialize. If you are interested in gears built to those standards have your secretary write for a copy of the complete catalog.

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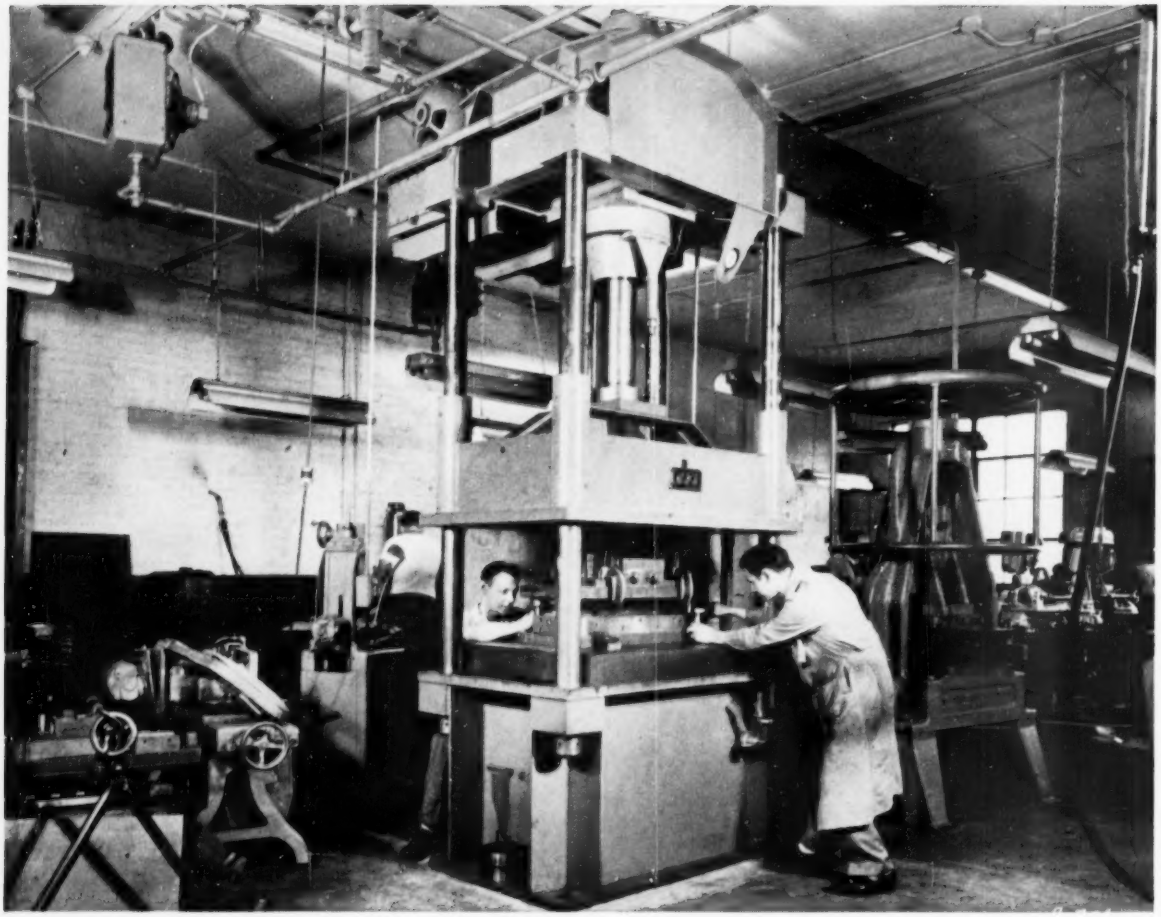
FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS



The diemaker who made a nuisance of himself

This is the story of Three Star Manufacturing Co.—a custom diemaker who serves a number of manufacturing plants in Chicago.

As in most such shops, his only means of trying out dies was a hand power screw press which sometimes needed six or seven men to get the needed pressure.

Large dies had to be tried out on his customers' production presses . . . which required drayage ($15 to $20 each way) and interruption of his customers' production. It meant both expense and nuisance to his customers and himself every time a die had to be tested.

Now he has ended the nuisance by installing the press shown above in his own shop. It not only saves time and money, but avoids the embarrassment of having workers in his customers' plants see and know that occasionally a die must be taken back for adjustment.

Specifications for single-acting and double-acting die tryout presses in ten air-operated and sixteen electrically operated models are contained in Bulletin 267—sent gladly on request.

Write for Bulletin 267

Dake Engine Company, 636 Seventh St., Grand Haven, Mich.

DAKE PRESSES

Arbor Presses

Hand-Operated Hydraulic

Power-Operated Hydraulic

Guided Platen

Gap Type Presses

Movable Frame

strong for the apprenticeship system, but I know now that many excellent mechanics have never served apprenticeships. The American Federation of Labor wouldn't consider auto and bit workers for membership in their sacred craft unions at one time, and the CIO came into being in order to take care of those folks. Does anybody think they can laugh Walter Reuther and his CIO off?

Semi-skilled labor has always been with us, and it's here to stay. If a machinist develops to the point where he is able to do toolmaker's work, by all means make a toolmaker out of him. The word toolmaker is merely a synonym for skilled craftsman anyway. In the shop where I served my time, the high spots of the toolmaker's trade were the ability to figure and cut gears via a milling machine and an indexing head, and the ability to back off taps. I know many toolmakers today who wouldn't know how to back off a tap if their lives depended on it.

Toolmaking is specialized. A toolmaker from one shop has to learn additional facts of life when he enters a shop of another type of industry. Any man that can do a toolmaker's work is a toolmaker. That's what my book says.

James K Matter
Detroit, Mich

I SUPPOSE THE simplest answer to the title question would be—when he is making tools. But of course there is much more to it than that,—even the average machinist at some time or another has made tools. However, if he is honest about it he will admit that making an occasional tool does not make him a toolmaker. He knows that if the blueprints for an intricate die were set before him and he were told to go ahead and make it in the time that an average toolmaker would be expected to complete the job, he would find himself floundering in short order. It would be foolish to expect otherwise, as so many good machinists have found out who have tried to bluff their way as toolmakers.

What then is a toolmaker? As I understand it, a toolmaker is a craftsman whose training has been directed toward one end—the making of tools that will simplify production and control the quality of that production by building accuracy into the tools themselves. So a good toolmaker should be a better-than-average mathematician, have a thorough knowledge of the different grades of steel and the working thereof, and be proficient in handling machine tools to the closest limits of

For Unexpected Profits
IN YOUR SHOP

ask yourself these questions

- Could you increase your productivity and profits by *fast rearrangement of machines* to meet new production needs, with very little "down time"?
- Could you benefit by *speed in leveling certain machines?*
- In precision machining operations, such as grinding, do you ever find that rejects are *traceable to vibration?*
- Would you like to *forget about lagging machines* to the floor to keep them from walking?
- Would your worker productivity increase if you could *reduce plant noise?*

. . . then let us do something about the answers

The NEW Leveling Barrymount *can make profits for you out of problems you may have thought couldn't be solved.* It represents a wholly new idea in mounting machinery. What it can mean to you *in immediate profits* is described in this new bulletin.

Write TODAY for your free copy of "LOOK — NO LAGGING!"

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CLARK UTILITRUCS handle the toughest jobs at least cost!

...they're engineered to satisfy driver, maintenance man, management

Here are the most advanced 6000-7000 lb. fork trucks on the market today—Clark's gas or electric UTILITRUCS. Built to handle jobs that break the backs of less rugged trucks, these UTILITRUCS have proved their superiority in foundries, steel mills, stevedoring* and heavy warehousing. They represent an ideal balance of essential engineering features. They get more work done at less cost, for these reasons:

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All controls at the driver's fingertips, like an automobile; compact and more maneuverable; shockless steering; increased braking efficiency; 140 sq. inches additional visibility; 25 inches of free-lift; DYNATORK or HYDRATORK DRIVE available on gas model.

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Complete accessibility for maintenance. On gas model: one-piece "zipper" hood folds back to expose engine; one-piece floorboard lifts up to expose master cylinder and transmission; swing-out battery. All service points easy to reach.

3. Built to take punishment

Welded, integral-unit box frame eliminates distortion; higher inch-pound rating; axle-to-frame mounting absorbs shocks and strains; new design wheel and backing plate seals out dirt and abrasives. Oil bath air cleaner and oil filter standard on gas model. Totally-enclosed drive motor, sealed-for-life bearings on electric model.

We invite you to compare the UTILITRUCS to any 6000-7000 lb. truck on the market! Without obligation, you can discuss them with your nearby Clark dealer, listed in the Yellow Pages of your phone book. Or write us for free descriptive literature.

*Special stevedoring model available

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CLARK EQUIPMENT

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CLARK EQUIPMENT COMPANY
Battle Creek 3, Michigan

accuracy. In addition to this, he must be a competent hand-worker, as the machining of a die, jig, or fixture does not always mean its completion. There may be many hours of filing, honing, and fitting necessary before the work is complete. Tedious, exacting work, but work that requires a high degree of craftsmanship.

Obviously, then, skill of that type is not easily come by. In the older countries the apprentice toolmaker serves a five to seven-year apprenticeship at very small wages. During his apprenticeship he may also have to attend night school in addition to putting in a regular day's work, and at the completion of his apprenticeship might have to work several more years as an "improver," at less than the toolmaker's rate, before he finally makes the grade. Naturally, skill so laboriously acquired is jealously guarded. From the Middle Ages on to the advent of the trade unions in the early nineteenth century, the craftsman belonged to a guild, which existed for the sole purpose of protecting his rights and privileges.

Those guilds were so powerful that the Judsons of that day had as much chance as the proverbial snowball in hell of being admitted to the rights, privileges, and emoluments of a craftsman unless they served the required period of apprenticeship. The trade unions, of course, are an outgrowth or extension of the old guild system, and as such are against encroachment into their ranks of anyone, who, like Judson, have not met the apprenticeship requirements. They insist, and I think with justification, that the apprenticeship qualification protects the employer as well as the employee.

It would seem to me, then, that Al has done Judson and himself a disservice by promoting the man to toolmaker, especially if the union has an active membership in the plant. In any event, the toolroom boys are going to resent Mr Judson and make their resentment plain. Which bodes no good to company morale.

Robert S Alexander
Greenville, RI

ED SURPRISES ME often with some of his propositions, but usually about the time the hair commences to rise on the back of my neck I remember that he is purposely trying to "start something."

He comes from a tribe of fine machinists and I knew all of them forty-odd years ago.

None of them, including Ed, would ever have had trouble in properly

evaluating every shop man they worked with. They usually worked as toolmakers because they were entitled to that rating, and the pay was twenty-five to fifty per cent higher than the average machinist pay.

Machine shop employees were helpers, handy-men, machinists and millwrights, toolmakers, painters, and sometimes apprentices.

A helper was what his name implied, and he furnished assistance to someone capable of directing his efforts. A handyman was a man qualified in some particular shop performance, but not generally skilled or experienced in shop practices. A machinist was a man of all-around experience in the use of metalworking machines and the building of machinery largely constructed of metal components. A millwright was skilled in both metal- and wood-working, as well as construction of buildings and the like. In earlier days he was often a more highly skilled man than a machinist, and possessed a considerable engineering ability. A toolmaker was an experienced machinist who evidenced unusual ingenuity in devising methods and facilities for shop production operations and had earned a recognition of his ability as a producer of precise and accurate work.

Not all shops took apprentices, but those that did trained these young men as machinists; nobody ever heard of an apprentice toolmaker.

Nor was any other method of training toolmakers known until World War II when Sidney Hillman, of Ladies Garment Worker fame, under Roosevelt auspices, planned a course for training toolmakers in a few weeks from any available candidates.

There were some very fine tool shops that took apprentices, but they

"Don't publicize this fact, but some burglars broke in our offices last night and they couldn't even open the safe with our tools!"

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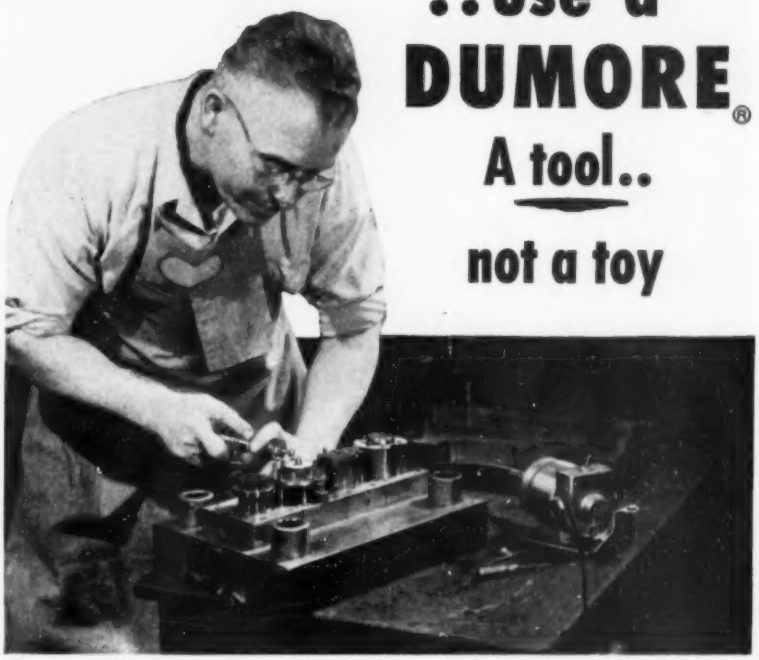

Don't be misled by extravagant claims for underpowered hobby-type tools. Manufacturers who want tip-top tool performance at all times turn to Dumore Flexible Shaft Tools.

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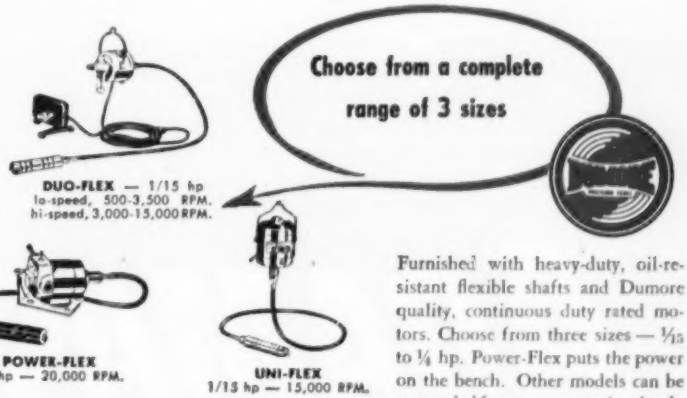

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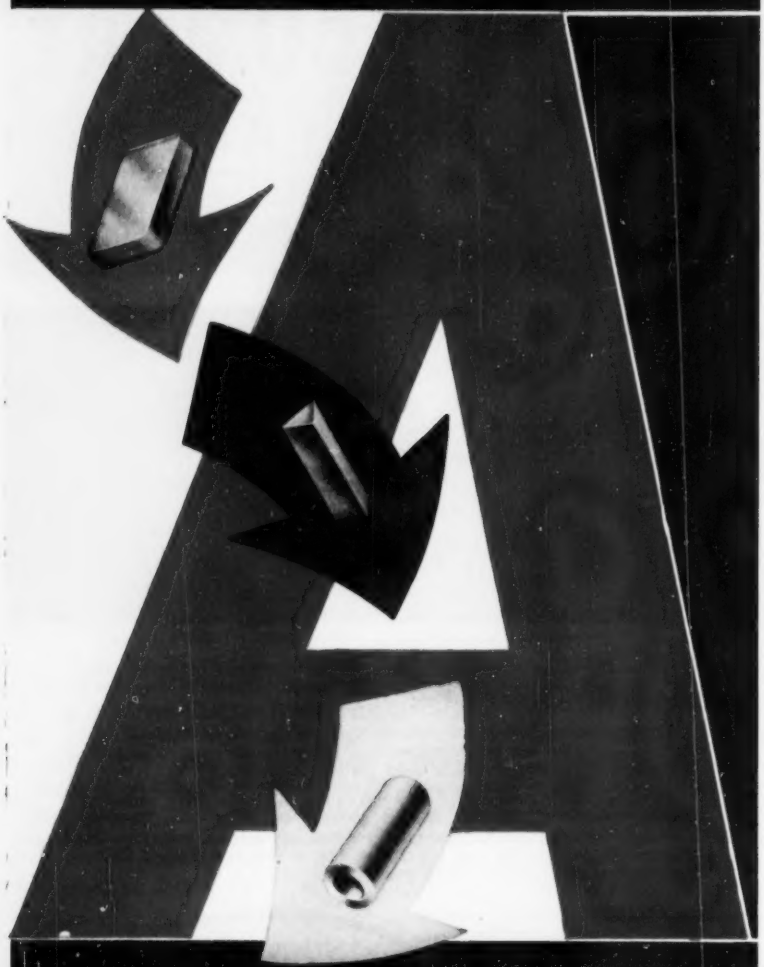

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were apprentice machinists. In fact, none of their apprentices worked in their own toolrooms, and a toolroom would be a decidedly poor place for a young man to serve an apprenticeship as a machinist. Some very fine machinists never served an apprenticeship but "stole the trade" by moving frequently from one shop to another and working as handymen in each, but always in new and different activities. At any rate, a machinist became a toolmaker when his exceptional ability was recognized, and he was given general employment in a toolmaking department.

There are some very large tool departments that employ no toolmakers or machinists, and so divide the work among specialists that only handymen are needed. There is a shocking tendency to call such employees toolmakers.

There is an old definition of toolmaker that carries a taste of sour grapes but might help decide—when is a toolmaker? "A toolmaker is a slow machinist who never knows when a job is finished, often wears an apron instead of overalls, and gets ten cents an hour too much pay."

Lucien I Yeomans
Chicago, Illinois

WHEN INTERCHANGEABLE manufacturing was introduced it made mass production feasible and practicable, and a need developed for mechanics capable of inventing, designing, and making tools and mechanisms which would enable economical production of parts by unskilled labor. These mechanics, because they invented, designed and made the necessary tools, dies, jigs, fixtures, and special machinery for interchangeable manufacturing, were referred to as "toolmakers."

The very nature of their work required men with inventive as well as mechanical skill—true mechanics, able to work alone, and to feel their way through a problem or situation. Their place of work was set apart from the purely production area—they were supplied with, and often made, the single-purpose tools with which they made the tools of production. These toolmakers soon became specialists and offered their services on a freelance basis to manufacturers whose business did not warrant the maintenance of a private toolroom.

As manufacturing plants grew, more toolmakers were needed and some manufacturers set up apprenticeship courses to supply their own needs for toolmakers. These apprenticeship courses included training in

New "slant" on DELTA Drill Presses boosts output at Atlantic Service Co.

Easier cleaning, better lubricant flow, reduced operator fatigue are extra benefits for Brooklyn shop.

A gang set-up of eight Delta 14" Drill Presses mounted at an angle of about 30° and operated by one man, boosted output and made a healthy cut in costs for Atlantic Service Co., Brooklyn, N.Y. This production speeding hook-up was possible because versatile Delta Drill Presses *operate in any position:* upside down, sideways, at any angle.

All spindles in Atlantic's set-up are connected to a master shaft and move simultaneously. Parts to be drilled are held on adjustable jigs. As many as 100 holes are drilled in each piece.

The tilted table is easy to keep clean, improves lubricant flow, makes the operator's job much easier—all of which contribute to a competitively low production cost.

Why not work out your own money-saving slant...as thousands of resourceful shop men are doing? Your Delta dealer can help you—he's listed in your Classified Telephone Directory under "Machinery" or "Tools". Write for the latest Delta catalog. Delta Power Tool Division, Rockwell Manufacturing Co., 618 L. Lexington Avenue, Pittsburgh 8, Pa.

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ALBION, MICHIGAN

shop mathematics, mechanical drawing, machine shop practice and training in the various manufacturing processes. With such a background of training, and a natural mechanical apptitude, there developed a species of mechanic different in attitude and skill than the ordinary grease monkey or production machine operator. Much was expected of him—he had to be methods man, designer and builder, all in one.

Today the toolmaker is not called upon to analyze production methods, nor to design or invent tools—there are specialists in each of these fields—thus today's toolmaker is of necessity a different type of mechanic than was the oldtime toolmaker. Today, the toolmaker is a specialist, a bench man or toolroom machinist, well qualified to do very fine work with very fine tools and machines.

To qualify as a toolmaker in the modern tool shop, a man must be able to read and to understand the drawings prepared by the tool designer. He must be capable of working within the close tolerances specified in modern tool design. He must understand modern toolroom equipment, of which some is highly specialized—he must be fast, no longer a "slow machinist."

If a man in the machine shop can work fast and hold to close tolerances on any or all of the machine tools, he should be given the opportunity to work in the toolroom. Of course, the other attributes such as neatness and accuracy must be considered. If this man is given the opportunity, and if he is properly supervised, there is no reason why he should not be developed to meet the specifications of todays toolmaker.

Henry George
Kettering, Ohio

*"The %¤*XX thing is stuck!—hand me that sledge hammer, will you?"*

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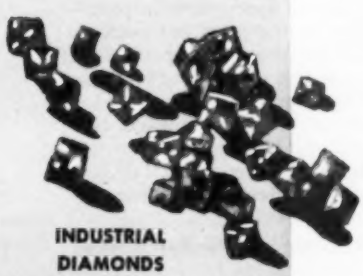

INDUSTRIAL DIAMONDS

The Man Who Swallowed a Fortune

"Here," shouted Seigneur de Sancy to his bodyguard. "Here are the marks of the melée. Find my poor Pierre and there, I know, you will find the diamond."

When they found the grave in the forest, they found, too, that the brave old retainer, carrying the great jewel to King Henry IV of France (so that he could pawn it to finance his armies) had foiled the robbers at the cost of his life. When his stomach was slit open, there lay the Sancy diamond.

For lending his diamond to France, Henry made de Sancy ambassador to the court of Queen Elizabeth of England, who liked the jewel so much that she bought it. It passed to Charles I, who lost his head on the block, and, later, to James II, who fled to France after a disastrous defeat and sold the Sancy to Louis XIV for $125,000 —a fancy price in those days for a diamond of 53½ carats.

During the Revolution, it was stolen with the Crown Jewels of France, found weeks later in a gutter in the Champs Elysées, quickly stolen again, re-discovered in 1828 when it was sold to Prince Demidoff of Russia for $100,000. Today, it is said to be back in India, where it was originally found, probably a thousand years ago.

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BIG RAPIDS, MICHIGAN, U. S. A.

ED SEEMS TO think that toolmakers are a special breed of cats, sort of a royal family in the machine field.

Al's putting Judson into the toolmaking group was a smart move in several ways. It kept him in the company where he had proved his worth. Assuming, of course, that he made good in his new job, as I have no doubt he did.

It isn't easy to see why toolmakers are a special breed or require special training, except as to accuracy. And many parts of machines require as accurate work as the tools which make them. Way back in the dark ages of machine shop work the toolmaker was called upon to design tools and figure out new ways of doing work, so that inventiveness and ingenuity as well as good workmanship were necessary. He also had to select the best steel and heat-treat it after it was made. He had to know how to harden a tap and draw the temper to the right point for the work it was to do.

Today the toolmaker gets the blueprint from the tool engineer, who usually specifies the steel to be used and perhaps the heat treatment. In any case the toolmaker's only job is to make it according to specifications, leaving the selection of steel and its treatment to others. He is a high grade machinist who can be depended on to follow the blueprints as to accuracy.

Some of the tools that come out of the modern toolroom are works of art. But so are many machine parts that are made in the shop itself, instead of the toolroom. Ed sounds as though he remembered the old days, but otherwise he does not seem old enough to know much about them.

Fred H Colvin
Point Pleasant, NJ

TOOLROOM OR SCHOOLROOM?

Is it risky to put a new man on a tough job, even though he is supposedly qualified by experience in other shops? Does learning by doing justify possible waste of time and materials?

IF ED DOESN'T HAVE a qualified man to make a combination die because those who are capable are busy making other important tools, he is either a poor organizer, or he has failed to engage enough apprentices in previous years. Management has perhaps prevented him from paying sufficient attention to the problem of training enough help for the future.

If Barrett has only worked two years on dies it looks to me as though Ed is betting too much of the company's time and material when or-

dering him to make a combination die. As a rule this is a very difficult job. But, of course, Barrett is perhaps a smart young man who is well qualified to make complicated tools. It depends on his background and what kind of a brain he was born with. Perhaps the combination die in question is not so difficult either.

The right thing to do in any toolroom is to train enough help so they are there when needed. If Ed intends to train Barrett on this job why not let Miller, who has a large experience, instruct him how to go about a job of this kind and warn him of pitfalls that might arise? This would save Ed from too much worry about the outcome of this test and give Barrett some valuable information for the future. If he is not guided at all he might fail and perhaps Ed will lose a good diemaker-to-be.

If Barrett failed to make the cam die correctly, it might or might not be a drawback for his present job. He has perhaps learned from his mistake and will handle the present die more carefully. Under all conditions, Ed should take steps to train him, but this training should be carried out step by step so that he won't have to risk too much of the company's time and material.

Young men should not be used on too difficult jobs. A certain conservative attitude must always be observed, but a little confidence in every young man is also necessary. If Ed is a capable foreman he should study every man and learn how much confidence he can put in each guy.

Had Ed not earlier taken steps to develop his young men, he might have to nursemaid some of them through difficult jobs. But he can also combine young and elderly men

"Somehow, Beemis, that remark you made about me at the shop party last night doesn't seem so funny this morning!"

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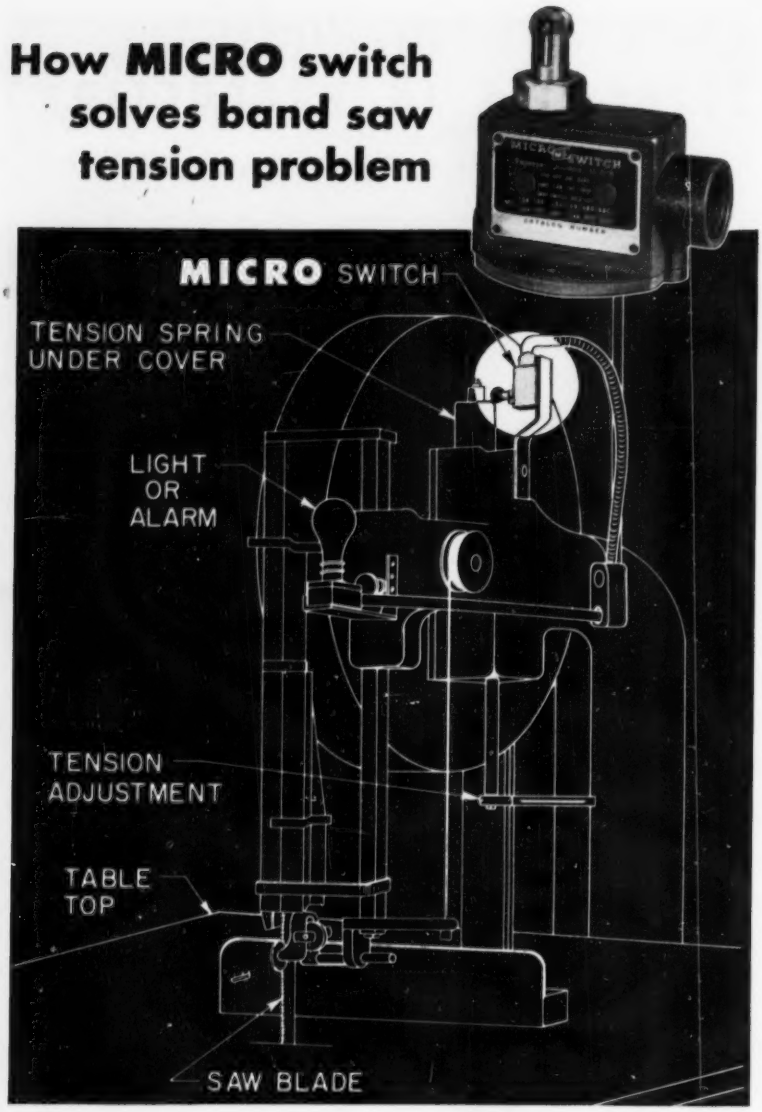
How MICRO switch solves band saw tension problem



• Improper tension is a frequent cause of accidents from broken band saw blades. This tension is regulated by a "band screw" on a sliding sleeve at either the upper or lower band saw wheel. The position of the sleeve indicates the tension.

One plant engineer connected a MICRO switch so that when the sleeve travels beyond the danger point, the switch turns on a warning light. The operator then knows the blade tension is incorrect and can shut off the machine and make immediate adjustment.

This plant-made application is typical of the hundreds of uses that plant superintendents, electricians and maintenance men are making of MICRO switches to make present equipment safer, more efficient and more productive.

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on the same or different jobs to prevent risking too much in each case. If he does, he should also have time to look after all the rest of his boys.

I don't believe young Barrett will be able to do the same kind of jobs as the more experienced Miller just because he's finished one combination die. He probably needs to make a couple of dozen such dies before he is fully trained. I should think Barrett must work eight more years at diemaking before he is capable of handling the most difficult jobs. Nobody becomes an expert without long training.

Ed is perfectly right when he says there's a little schooling in every tough job, and the best way to learn is by doing the work yourself. Every toolroom is more or less also a schoolroom.

A E Fristedt
Stockholm-Bromma, Sweden

IT CERTAINLY TAKES some forethought when assigning work to a man with whom one hasn't worked for a reasonable length of time. Unfortunately we haven't got a large number of Millers, men who have proven themselves by many years of service, so as to pick on them to handle intricate jobs.

While we have the assurance of getting a satisfactory job done, we must look at the shop program from a long viewpoint. The Millers will not always be with us and when they go—vertically or horizontally—we don't want to be stuck by their absence. It behooves Ed to look into the future and spread his work among the men so as to build his shop personnel in such fashion that no disaster will be imposed in the event of one's leaving.

A new employee comes in with years of experience behind him to back him up in his service. He should receive sufficient confidence from the foreman, after he has given evidence of being "on the job," by being given work of a nature usually considered difficult. When work is assigned to a man and gone over with him thoroughly the man can assure the foreman that he can do the job—he should know his own capabilities. It is foolhardy to give a difficult assignment to one who has not shown exceptional ability and confidence in himself.

There are times when a foreman is under a certain amount of pressure and he is forced to give out jobs to men who are doubtful. How are the men to receive their experience if they cannot work on new work on which they have had no experience?

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—says **Ludwig Meyerott,** foreman,
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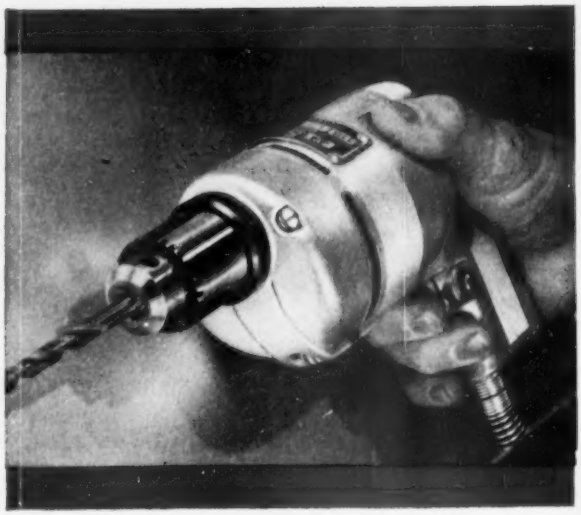
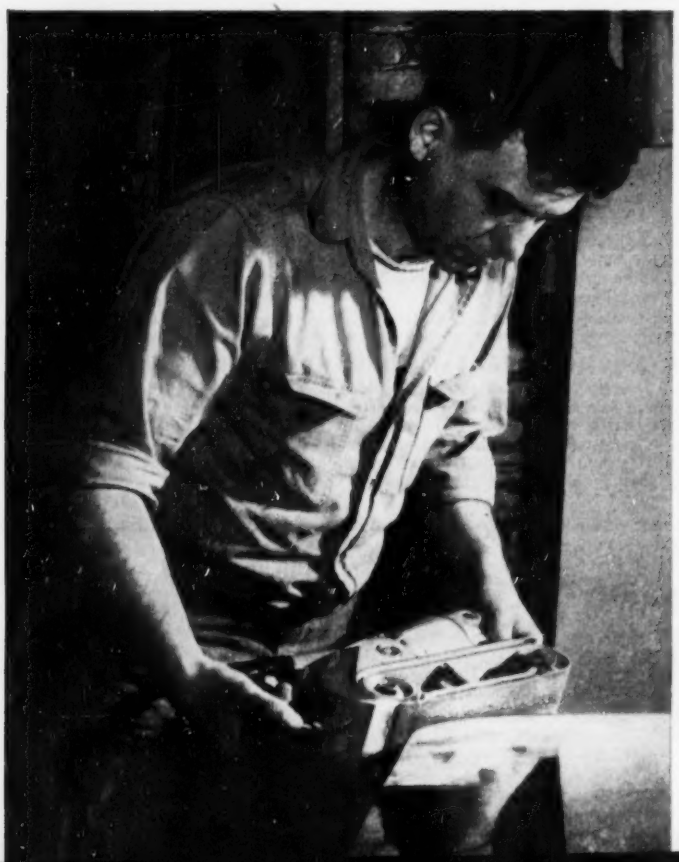
makers of custom counters and sink tops for commercial and home use.

"We use this drill on every type of material and we use it every day," says foreman Meyerott. "It has had such rough use little of the original markings show on the name plate, but after 16 years this SKIL Drill still gives us the best, clean, sharp drilling you could ask for. And in all that time, it has been out for repair only once!

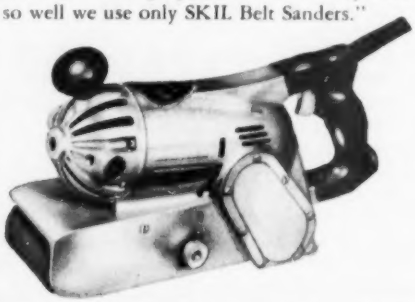
"SKIL Drills are easier to handle—even in cramped places," Meyerott continues. "The balance is just right, the design is compact. And you need less pressure with the power and easy grip."





Foreman Meyerott Sands Aluminum With the Model 448 SKIL Belt Sander. "This tool sands plywood, solder, aluminum—any material that comes along," he states. "And we always get a fast, smooth, flush job. For large areas or close work we find SKIL Belt Sanders best.

"We *need* tools that can be adapted to any material or job, so a man can go from one operation to another without changing tools. Because they 'fill the bill' so well we use only SKIL Belt Sanders."



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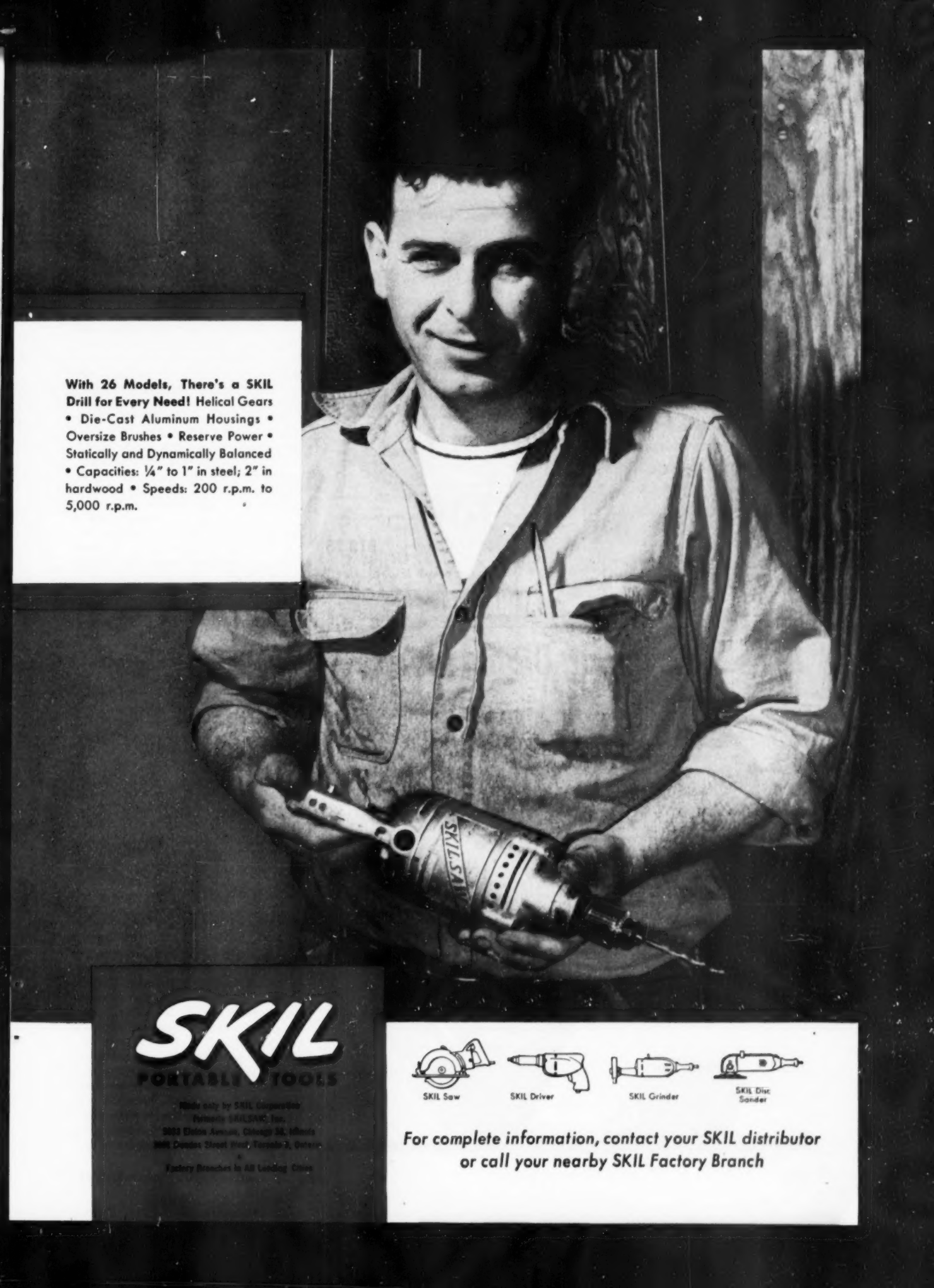

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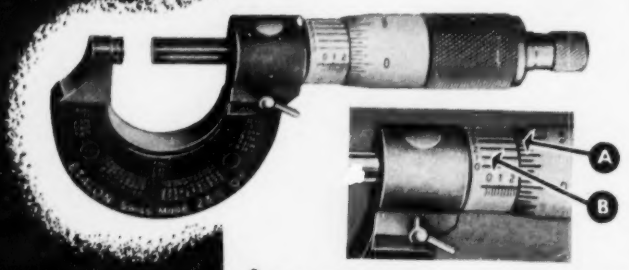

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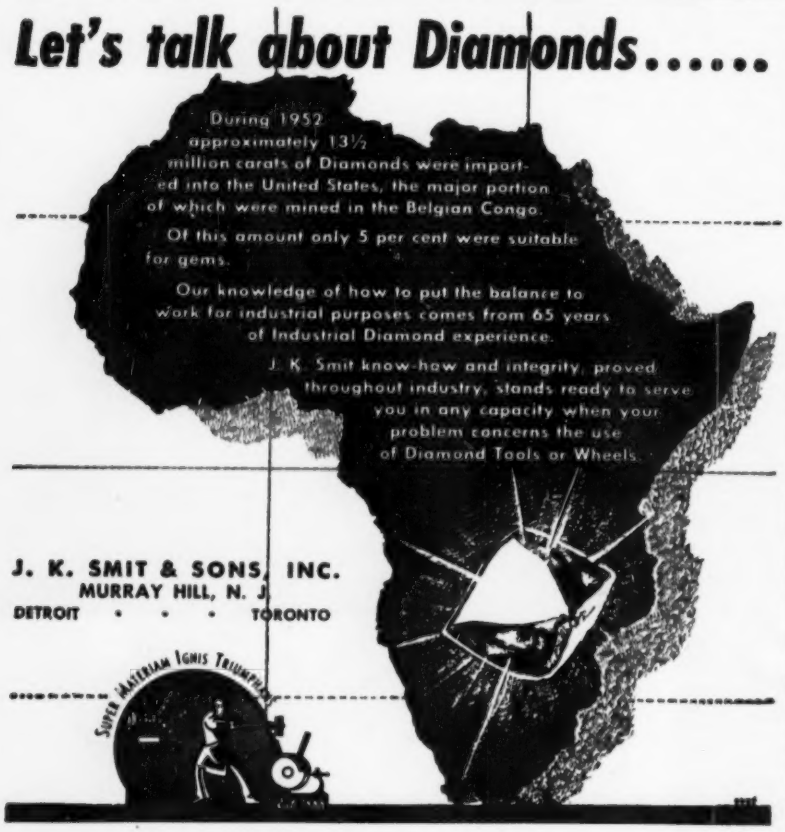
During 1952 approximately 13½ million carats of Diamonds were imported into the United States, the major portion of which were mined in the Belgian Congo.
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Can we expect the other employers to train men for us? There is a certain amount of risk in running a business and it is up to the foreman to assume his share of it. How are you to determine the worth of a man if you don't try him out by fire?

In my earlier years at toolmaking it was my privilege to observe a case in point. About two weeks after I was taken on, another man arrived and from all appearances—elaborately-fitted, highly-polished, oaken toolbox and starched apron covering up a pair of meticulously-pressed trousers—was what I had often heard referred to as a "humdinger." There were a considerable number of new jobs being given out at the time and, seemingly under unusual pressure, the foreman gave a rather complicated one to our untried friend. This new member of "Lard, Oil & Chips, Inc" had put up quite a talk about his experience, and immediately gained the foreman's confidence. This large combination die consisted of a considerable number of individual parts which in all consumed quite a bit of time before assembling. No one checked the man for errors and he worked along uncomplainingly for as long as he possibly could. One day, after he had been working on it for a couple of weeks, he stayed out and the boss, making his morning rounds, stopped at the bench to look things over. It wouldn't take a scientist in human nature to know what the trouble was when he was heard to utter a long, drawnout groan. There was an empty spot on the bench the next morning. Now here was a case where the foreman should have assigned one of his trusties to keep his eye on him, if he himself had not the time to do so, to observe the progress of the work.

While we have the traveling type, as just outlined, who breezes in, commits murder, and then makes a quick getaway, we also have the man who has the ability to do a big, difficult piece of work but who, through lack of confidence on the foreman's part, is not allowed to prove himself. I have always contended that it is a big mistake to build a shop around one man because when calamity happens the shop has to suffer from lack of sound foresight. No man should be made to feel that his services were indispensable or he will become too damned important in his own estimation.

Of a certainty Ed is taking a chance in giving Barrett the big job; he would be taking a chance were he to do the job himself, so what the hell! While Miller has proven himself effective, there is no saying that he will not fall off his pedestal by

some fluke of chance. Business is based on chance and certainly the assignments given to the workers have a certain amount of chance in connection with them. It is up to the foreman to be wide awake to his job and do a little more checking up on his men to ascertain what they are doing. Ofttimes he is penny wise and pound foolish in that he confines himself behind a barrier doing paper work instead of spending more time in supervisory observation.

The progressive worker appreciates being given the larger, difficult jobs and doesn't feel unkindly toward his foreman if he shows an interest in what he is doing. The man knows that the foreman is there to see that the work is done right. Often you'll find that a new man possesses more skill and know-how than you give him credit for, notwithstanding the mechanical highjacker who bluffs his way around occasionally. The worker learns as he does, and it is up to every firm to withstand the expense of this learning albeit at times rather costly.

What if you do have to nursemaid a man along? He'll develop into a better worker if you coach him now and then until he finds the use of his "know-how" legs. He knows that it is up to him to make good and that if he doesn't he'll pay up for it. You can rest assured that he is going to do his utmost to turn out a first-class job in appreciation for the faith you have shown him.

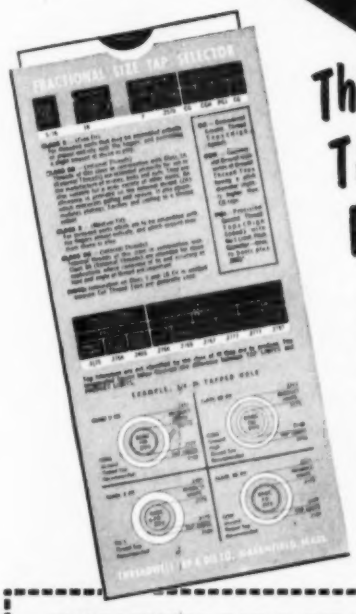
Don't make a mistake and confine your limits to one man's accomplishments, Mr Foreman; pile it on to Miller and one of these days he'll decide he's too good for you and you'll find yourself holding the golden egg. As far as wasting time and material on a man who isn't proven —how is he going to prove himself if you don't give him the chance?

J Homewood
Tujunga, Calif

COFFEE BROKE

Does the coffee break tend to increase or break down shop morale? Should the tendency of some workers to take advantage of the allotted time warrant elimination of the practice entirely?

ALL OF US HAVE experienced at one time or another the feeling of renewal that comes from a change of pace. We may be walking or driving along slowly, and something happens that makes us speed up. New sensations occur; new thoughts cross the mind. We become more alert. The pace that kills is the pace that never changes. As you work at any fatigu-



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ing task you will find that an occasional change of tempo rewards you with a renewed charge of energy. Applying the idea of a change of pace to shop work, it has been found that the coffee break is a good media for enabling a worker to get a breather for renewing energy and reducing fatigue.

Most modern plants have adopted the idea of specific rest periods during the working day as an aid to worker efficiency. In addition to making allowances for fatigue and personal time, industrial engineers include specific amounts of time for rest and refreshment in their calculations of time standards for incentive jobs.

The practice of giving mid-morning and mid-afternoon breaks started with office and sedentary workers, spread to the operation of coffee-wagons and soft-drink trucks which toured the plant, and finally recognized that employees would take rest periods on their own initiative, whether management granted them or not, and that better control of the situation could be maintained if everyone was granted a recess at the same time. The cost item is by no means inconsiderable. However, there is good reason to believe that the cost of such rest periods is justified by the gain in productive efficiency resulting from them.

In my opinion, the coffee break is a good idea. The average man will work harder to compensate for such concession. Of course in every group there are some who will take advantage of a good thing and spoil it for the rest of the workers. Self-policing by the group, to make offenders see the light, is the solution for those who would take a mile when given an inch.

Much modern production is repetitive, monotonous, and tiresome. This

"I don't care if they do run it up the wall at baseball parks!—It isn't necessary here!"

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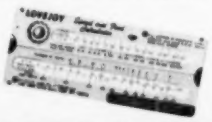

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repetitive work builds up nervous tension which results in increased fatigue. Such fatigue may cause accidents, impair the worker's skill and judgment, or cause the worker to be less accurate. It has been reported that in some plants most of the rejected work occurs toward mid-afternoon. Insofar as these factors prevail, the rest period and coffee break seem wholly justified.

Industry has been forced to depend more and more on inexperienced workers. They are less likely to stand up well under the demands of modern industry. Many industrial relations men feel that industry can ameliorate the problems of these substandard workers by introducing two daily rest periods. But this is not wholly for the substandard employees. Skilled, experienced, able-bodied workers may need rest periods also.

In one plant with which I am familiar, there are two ten-minute rest periods each working day. A signal to stop work comes over the public-address system. For the next nine minutes employees may go to the cafeteria, drink coffee, milk, cold drinks, eat a piece of candy. Perambulating snack-stands circulate through the factory. After nine minutes, another signal sounds. A minute later every worker must be at his post. This company has built up a healthy respect for discipline, and the rest periods are observed with precision. The company claims that production at the plant exceeds that in comparable plants throughout the area that do not have these rest periods. The top-side is convinced that rest periods are one factor in the company's high production record.

Of course there are stumbling blocks to the coffee breaks and rest periods. Generous rest periods in some plants have been abused. Some executives say that rest periods originally intended for ten minutes soon became fifteen- or twenty-minute periods. It is necessary to discipline rest periods and police them to some extent. Much, if not all, of the benefits disappear when a rest period or coffee break degenerates into a loafing spell, or a time for horseplay or beefing.

In one company, meetings of the labor-management committee discussed rest periods and coffee breaks at considerable length before agreement was reached. Some of the worker group were vigorously opposed to the idea, feeling that rest periods and coffee breaks would not be properly observed, or that production would suffer to the extent of time lost. When the rest period plan was announced, workers were told that it was only

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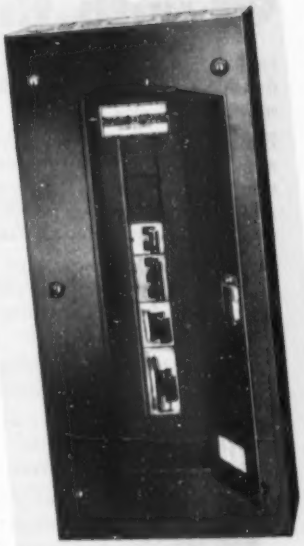

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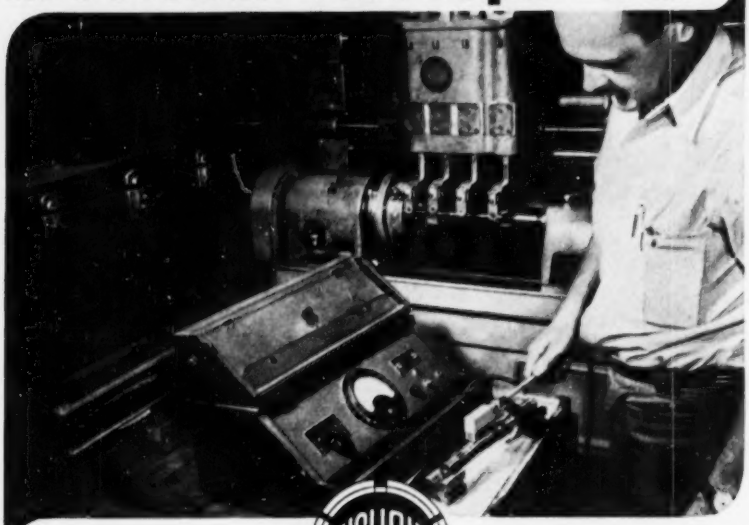

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"The Profilometer has proven invaluable in checking surface finish performance quickly and accurately", says Gisholt.

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In your plant, too, the Profilometer can offer exceptional advantages as an all important shop tool.

To learn more about the Profilometer, write today for this free bulletin—"Practical Features and Applications of the PROFILOMETER."

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an experiment, subject to quick cancellation if there was a slump in production, if the idea was abused, if employees failed to return to work on the moment of the rest period's end. The workers entered into the spirit of the experiment and policed it more strictly than management would probably have done. Workers who lagged in returning to machines and benches were roundly criticized by fellow workers, and told to mend their ways, else the privilege would be withdrawn.

In my opinion, before a coffee break or rest period plan is adopted in a plant, it should be put up to the employees. It may be worth while to permit employees to vote on the idea. If this is decided upon, the rest period should be announced as a possible concession to be tried out temporarily if the workers want it. Let them express preferences, and make it clear that the plan is a test which will be ended if the employees do not want it continued or if there is any abuse of it. If employees vote for rest periods, management should decide on the best times, announce the plan, and instruct all foremen and supervisors to enforce the rules requiring all employees to be back at work when the bell rings. Management should define the areas to which employees may go during rest periods. It is not customary to permit them to leave the buildings, but it is a good idea to let them visit refreshment stands, candy machines, coffee vending machines, sandwich stations, or the cafeteria if it is open.

Two general types of rest periods have been developed, namely, stated rest periods at the middle of the morning and at the middle of the afternoon, and a change in the type of work. Rest periods involving change in type of work may involve a change of tasks. This is particularly desirable, if possible, with those workers who must perform the same operation day in and day out. It may involve having the worker secure and deliver his own material. It is not always profitable to bring material directly to the tool point of a worker and to take that material away from the tool point of the worker; this is particularly true if the worker must remain in the same position at all times because of the nature of his machine.

Stated rest periods of five, ten, or fifteen minutes during the morning and afternoon grew very popular during the war, and have since been retained in a large number of plants in which they were instituted at that time. There was a great deal of reaction against this type of rest period

Illustrated are but a few of the many popular W & B drills and reamers. Complete lines of High Speed and Carbon Steel drills and reamers are also available. Catalog No. 105, available upon request, lists and illustrates the complete Whitman & Barnes line of quality tools.

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For efficient high speed drilling of cast iron, plastics, non-ferrous and abrasive materials. Diameters from 1/8" to 1 1/4".

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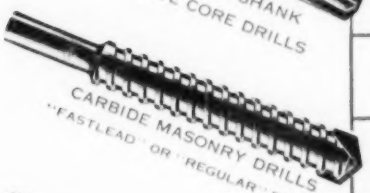

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CARBIDE STUB SCREW MACHINE REAMERS

Provide fast, easy drilling of concrete, cement, brick, slate, marble, stone and all types of masonry. Diameters from 1/8" to 1 1/2".

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Carbide extends full length of barrel preventing scoring or galling and insuring high-finish hole. Diameters from .1881" to 1.010".

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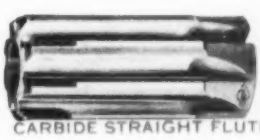
Save time by drilling hardened steel in the range of Rockwell C40-65 without expensive annealing. Diameters from 1/16" to 3/4".



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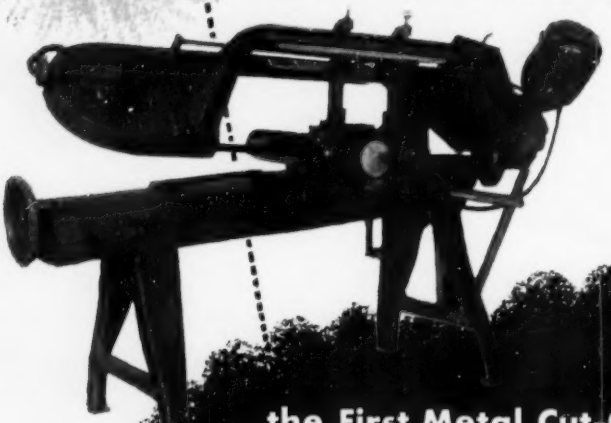

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THE NEW WELLS MODEL 800, engineered to use blades 1" in width, is a heavy duty, metal cutting band saw designed to bring new accuracy and efficiency to your production cut-off operations. The outstanding features of the Model 800, including its extra rigid construction and the newest developments in the horizontal band saw field, provides a new high in production cutting.

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DESIGN FEATURES

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For complete information on the Model 800 and recommendations of blades best suited for your operations, contact your Wells Distributor—or write for descriptive literature.

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immediately following the war, because it has been instituted frequently under conditions which were not suitable for it. It is only satisfactory where machinery can be stopped and started at a given time. This holds particularly true with regard to the stoppage of machinery in the case of piece workers, and the starting of machinery with day workers. Furthermore, such rest periods seem to be most successful when the workers affected are women rather than men. Though rest periods do not result in the scientific elimination of cumulative fatigue, they do offer a palliative which is similar in effect to that of the noon hour.

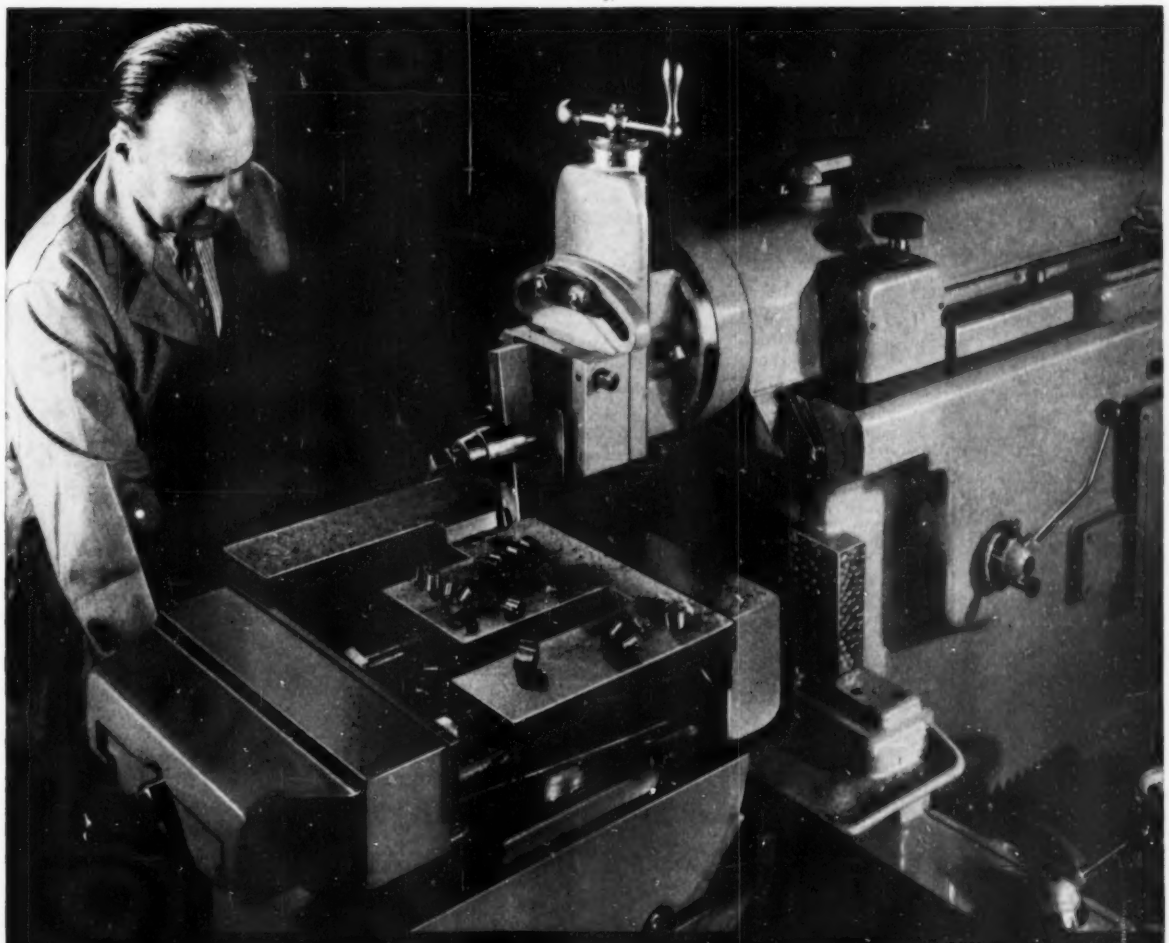
A recent survey of over 1100 companies indicates that 78% have initiated coffee breaks of their own accord. It was found that these time-out sessions of ten to fifteen minutes were actually a reform of the previous time-wasting and costly habit of "coffee by stealth."

Efficiency experts have long been trying to find the number of working hours, the manual methods and physical conditions which would give maximum daily output. But there is something more important than hours or wages or physical conditions; something which will increase output no matter what was done about physical conditions. This mysterious something is hidden in human nature. It is a man's pride and feeling that seeks to have others regard him as a person and human being. When management sets up a system of rest periods or coffee breaks, as minor as this concession may seem to some workers, the majority of men will feel that the company has their best interests at heart and considers them as persons and human beings.

The coffee break is here to stay as a fatigue breaker.

Harry Kaufman
Philadelphia, Pa

"I'm taking up a collection for one of the boys getting married—me."



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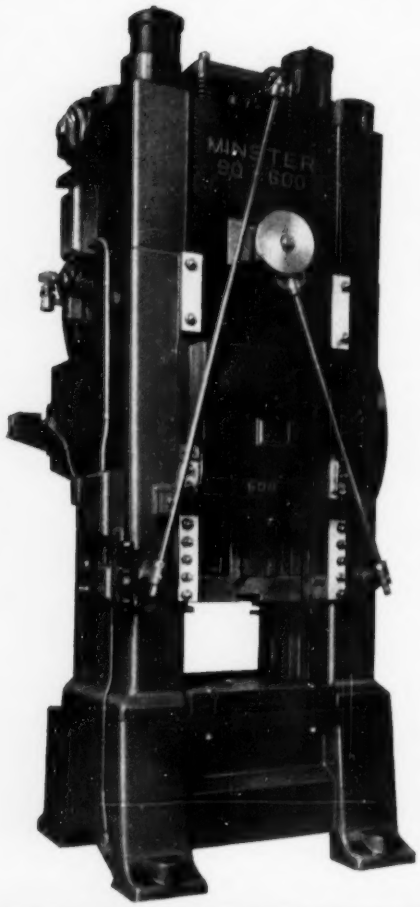
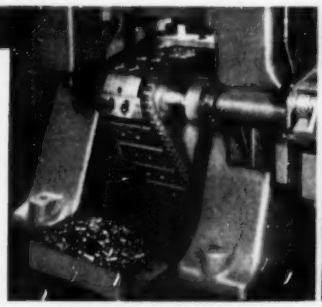
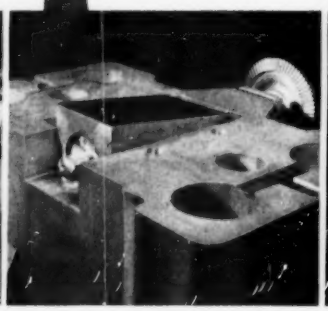
RUGGEDNESS...you



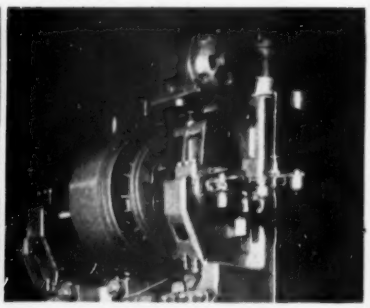
■ One of the basic reasons Minster presses have rung up such outstanding performance records is their unusual ruggedness. Engineered into every Minster is the extra strength, extra rigidity needed today for fast, accurate, vibration-reduced press operation. From the massive main frame down to smallest control box mounting a Minster press has what has come to be called "Minster stamina".



■ Everything about a Minster is rugged. This rear view of a knuckle-joint coining press with continuous chain feed shows the massive frame and heavy-duty feed mechanism.



■ Another example of Minster press ruggedness . . . massive, accurately machined adjustment wedge for knuckle-joint presses. Can't be forced from machine.



■ Minster combination friction clutch and brake . . . most compact, rugged, efficient unit of its type ever built. Perfect press control . . . trouble-free press operation.

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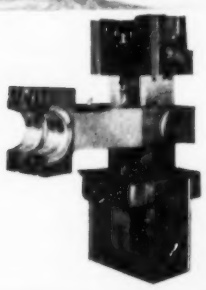

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NEW BOOKS

MECHANICAL CATALOG—*Published by the American Society of Mechanical Engineers, 29 W 39 St, New York 18, N. Y. 656 pages, 8½x11¼.*

Engineers in every field of endeavor will find this 1954 edition an essential item on their bookshelves. It not only tells who makes what, but also includes valuable information to aid in selecting the types and makes of products most suitable for a particular application.

The volume is divided into four sections; the first, or catalog section, gives product information, technical data, and specifications supplied by manufacturers; the second is a complete catalog of ASME publications. Section three consists of more than 50,000 listings of 6500 products and 4600 manufacturers, cross-indexed with the catalog section. Section four is a Trade Names section extremely useful for users seeking a source of supply for products known only by a trade name.

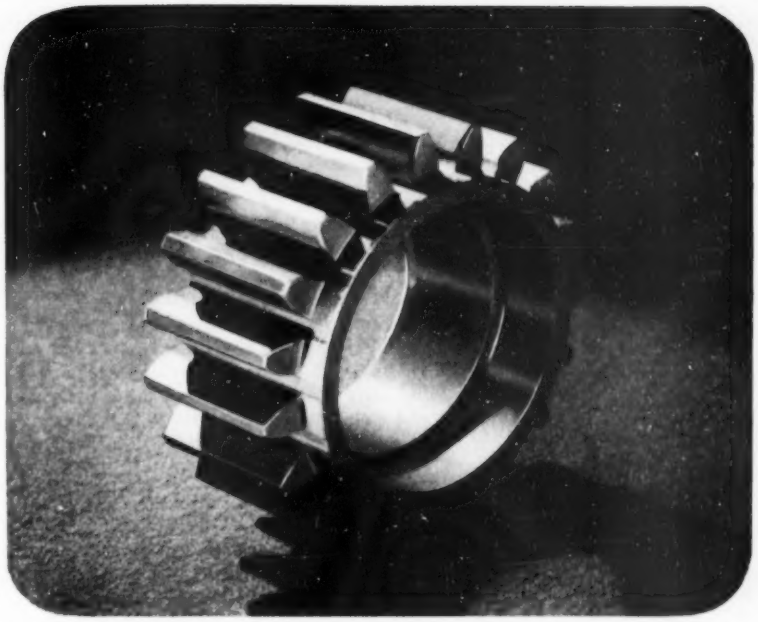
•

FABRICATED MATERIALS AND PARTS — *By T C DuMond, Editor of "Materials and Methods." Published by Reinhold Publishing Corp, 330 W 42nd St, New York 36, N Y. 332 pages. Price $6.50.*

This is a review of the most important materials, and of methods of forming them into commercial parts and products. The aim of the book is to provide all important information necessary for deciding which particular method of production is best for a specific case. Therefore, the book is suitable for classroom or design-engineer readers, or others connected with these classifications.

Some of the main manufacturing methods covered are casting, forging, extruding, cold-heading, spinning, welding, pressing, and machining. There are 23 chapters in the book, most of which cover separate manufacturing methods, so each discussion is fairly general. Some coverage on costs, production, and design factors is included.

The text should be some help in figuring relative methods cost factors and in deciding upon one process in preference to another. However, more detailed figures from the specific experience of a given manufacturer would probably be necessary to allow solution of a particular problem.



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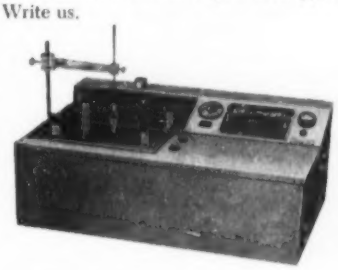

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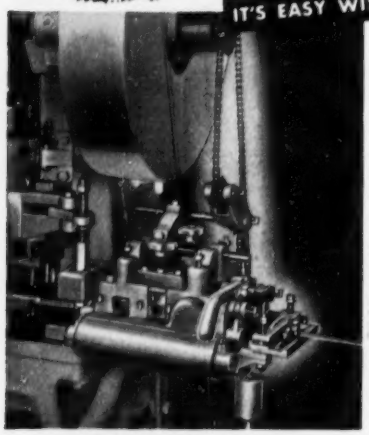

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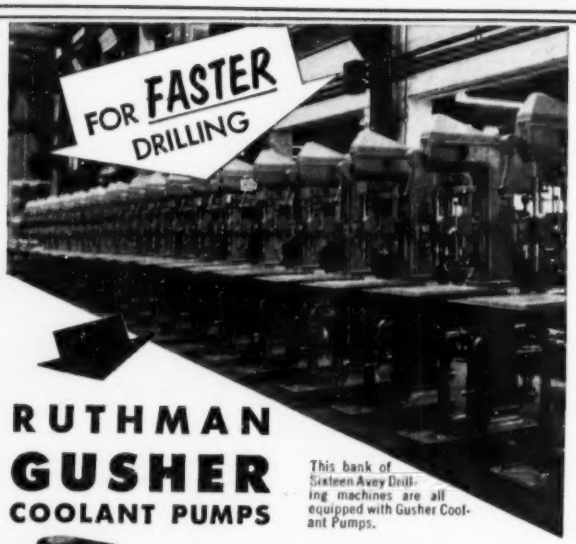

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Always specify Gusher Coolant Pumps—You'll eliminate coolant problems.

THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

REFRACTORY HARD METALS — *By Dr Paul Schwarzkopf and Dr Richard Kieffer, in collaboration with Dr Werner Leszynski and Dr Fritz Benesovsky. Published by The MacMillan Co, 60 Fifth Ave, New York 11, N Y. 447 pages. Price $10.*

"Borides, carbides, nitrides, and silicides" is the subtitle of this text, which covers the basic constituents of cemented hard metals and their use as high-temperature materials. These materials are part of a growing field in which the materials are like metals in physical appearance and action, but are structurally inorganic compounds. They include the tool material, tungsten carbide, which was the most important early development in the field.

These materials have an unknown, but obviously important future, because they can be made to withstand much more severe conditions than known metals. In the power field, for example, they offer hope that much higher operating combustion temperatures and pressures can be achieved without reducing the engine to a molten mass of rubble.

This book is the first of two, and covers preparation, structure, and properties of pure hard metals. The second will treat production and application of hard metals—mainly cemented carbides.

The text is highly theoretical, and is intended for use by those educated in the engineering field. However, it is practical in that much information resulting directly from experimentation and trial runs is included. It is only the second book concerned exclusively with hard metals; so will be considered an authoritative work in the area it covers.

The field is actually powder metallurgy, for that is the only process by which these materials can be produced into usable forms. However, this book covers little of the actual production, sticking to basic principles of devising hard metals.

■

PLASTICS, THE STORY OF AN INDUSTRY — *Prepared and published by The Society of the Plastics Industry, Inc, 67 W 44th Street, New York 36, N Y. Two colors. 40 pages. Price $.32. Lower rates for quantities.*

As an introduction to plastics, this booklet for the layman covers the general situation within the industry rather well. It introduces plastics as materials, tells generally how they are made and formed, defines

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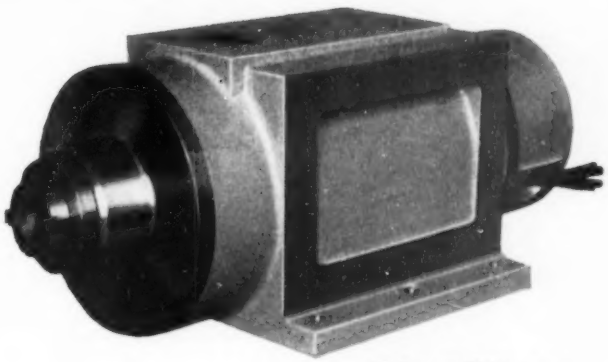

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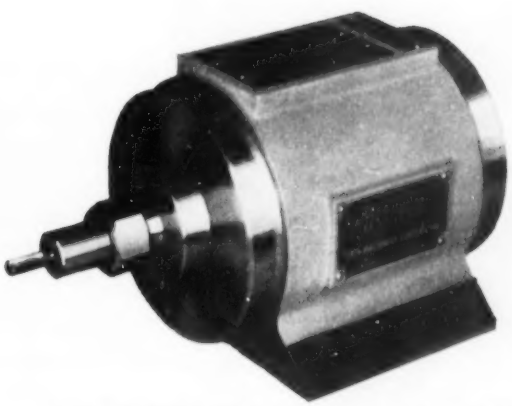

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the various classifications and types of plastics, gives examples of what kind of product is made from what plastic material, describes (with sketches) molding and other forming processes, and notes colleges where courses in plastics are given.

For its size, the booklet packs in a lot of information for a casual or poorly-informed reader. As an official publication of SPI, it also gives valid definitions and materials classifications of value to those working in the field.

A bibliography of supplementary reading material is also provided.

MAKING PERSONNEL PRACTICES AND PROGRAMS PAY OFF—*Published by American Management Association, 330 W 42nd St, New York 36, N Y. Personnel series, No. 151. 64 pages. Price $1.25.*

The pamphlet is a combination of papers by management authorities on the subject of treating personnel problems. It includes "Are Our Training Programs Paying Off?" by Theodore Hariton; "Research Findings in Employee Morale and Productivity" by Homer E Lunken; "Explaining Management Development to Top Management," a panel discussion; and "How to Make Up the Personnel Budget," a second panel discussion.

This is a regular publication in AMA's series on management, and present views expressed at the Midwinter Personnel Conference, Chicago, February, 1953.

TIMING ENGINEERING — *By Myrten G Saake, Application Engineer. Published by Ribble Engineering Co, 74-80 Montgomery St, Jersey City 2, N J. 243 pages. Price $5.*

Timing is so integral a facet of electrical and mechanical devices, few people have considered it as a separate subdivision of engineering. This text is evidently the first to take up the subject as a separable entity.

Timers and counters are taken and discussed by definition, function, operation, and application. The text covers industrial timers, synchronous motor-driven timers, both repeating-cycle and automatic-reset types, multiple-circuit timers, and "cycleflex," "timoflex," and "microflex" timers. Considerable theory and basic data is combined with discussions of applications in specific industries and for definite equipment.

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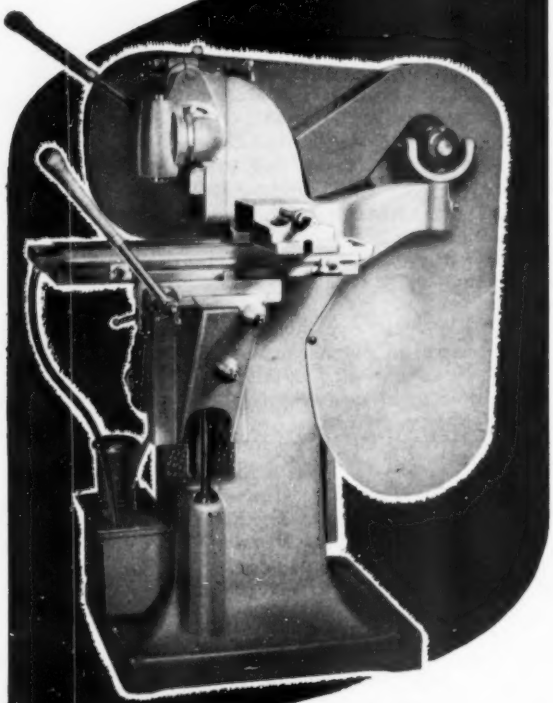

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Suggestions as to how a U. S. No. 1 Milling Machine can cut costs on your particular production needs, as well as complete data on the basic machine and attachments, gladly furnished on request.

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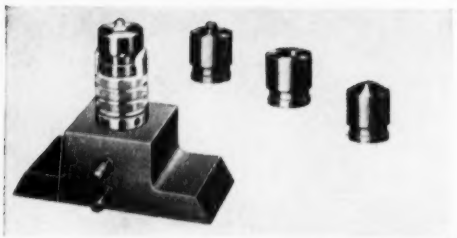

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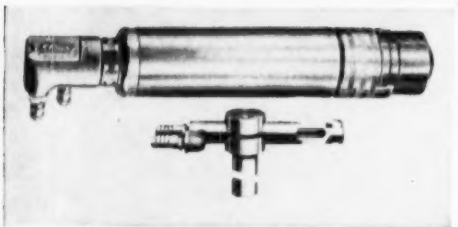

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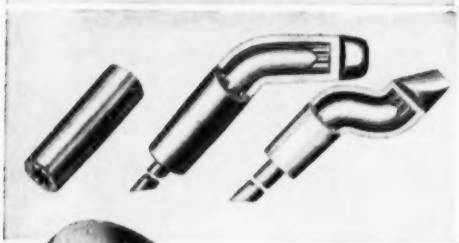

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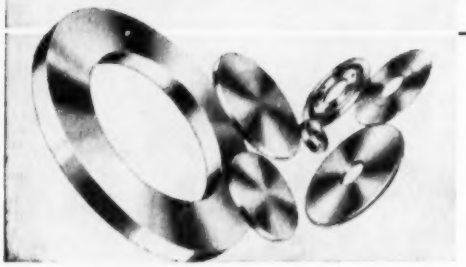

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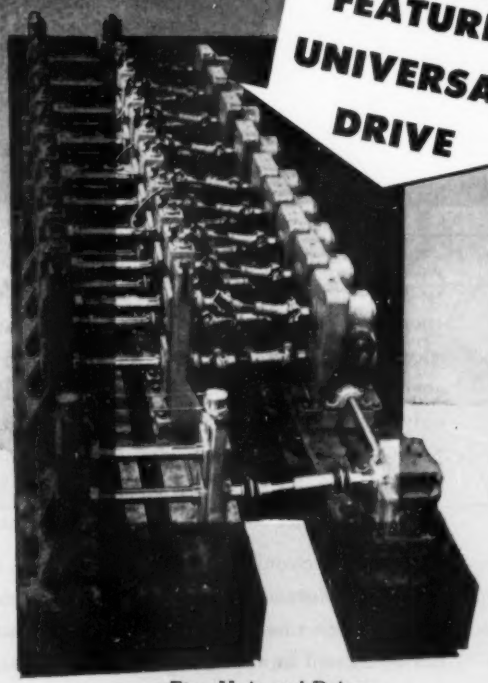
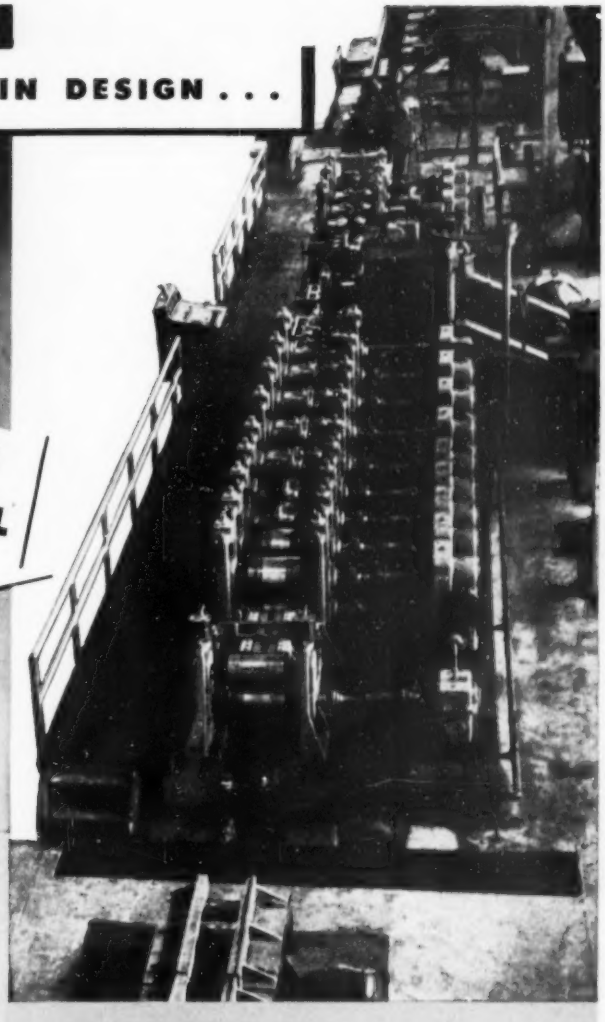


Etna Universal Drive



You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.

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For greater efficiency an *Oil Cooled Transformer* is incorporated into the machine. It is a *permanent unit* and *never has to be replaced.* Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills . . . Built for continuous operation. Write for complete details.

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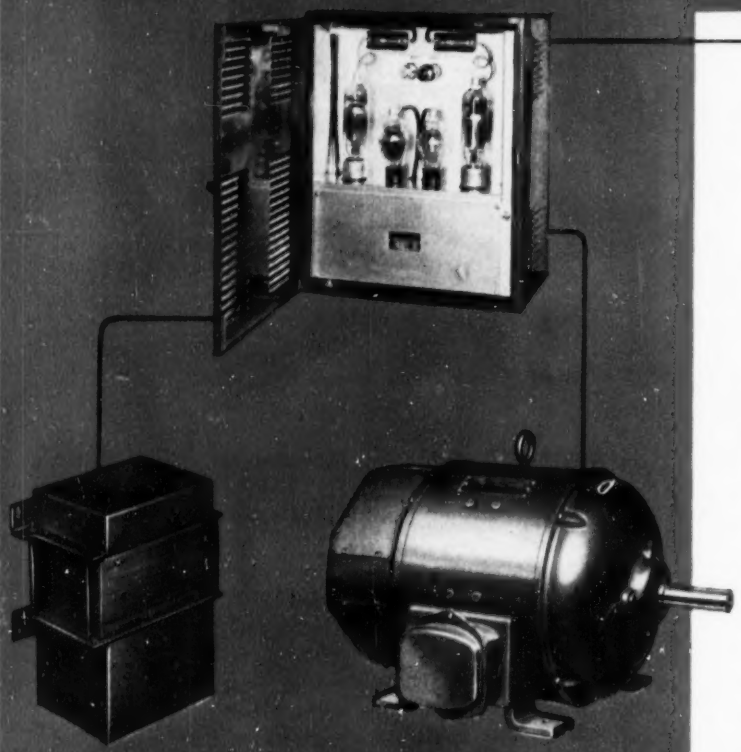

Connect this new Electronic Select-A-Spede to your A.C. power source and get infinitely adjustable speeds in ranges of 5:1, 20:1, or 50:1, with 100:1 also available for some applications. And that's not the only feature of this new variable speed drive. You get precise speed regulation — as close as ½% with tachometer feedback. You get rugged design for tough industrial service — simple, reliable, electronic circuits.

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The Electronic Select-A-Spede is ideal for machine tools, test equipment, conveyors, printing presses, balancing machines — wherever high flexibility and precise speed control are needed. Get full information on this versatile new drive from Bulletin No. 1500. Ask your Louis Allis Sales Engineer for your copy or write to us.

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Your production and purchasing heads will find it definitely worth while to absorb the specific features and applications of the Nicholson Special Purpose files covered in "FILE FILOSOPHY" and "10 SPECIAL FILE TYPES." These are two illuminating pieces of literature which may be obtained without charge simply by writing for them. (The files illustrated above, left to right, are: For Stainless Steel, Aluminum Type "A," Long Angle Lathe, Foundry, Lead Float, Curved Tooth, Super-Shear.)

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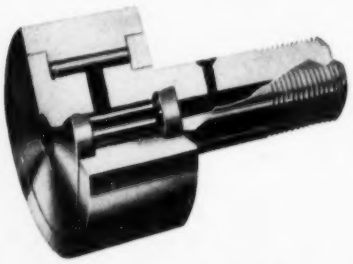
CAM ACTION IMPROVED with MULTIROL® BEARINGS

under heavier loads • with shock resistance • and space economy

Modern demands for faster, more automatic machines necessitate a new approach to cam action efficiency. Improvised bolt and roller units are no longer adequate for this mass production machine age.

Machinery manufacturers are finding that even at slow speed, it is difficult to carry the usual heavy radial and intermittent shock loads of cam application efficiently on plain bearings or standard antifriction ball and roller bearings. With increasing speeds, and lubrication limited by the desire for simplified design, the plain bearing wears excessively and fails early. Ordinary ball or radial roller bearings used on a shaft as cam followers have a



tendency to split in the outer race because of the excessive strain on the thin and superhard race sections.

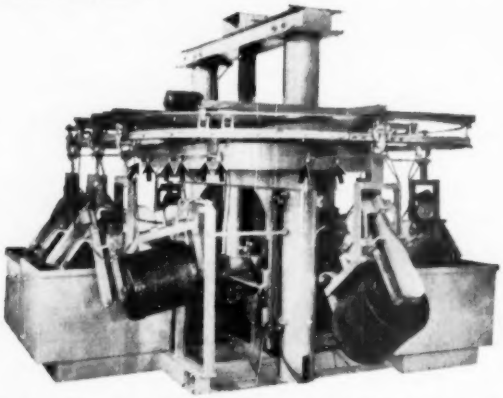
One bearing that has proven particularly successful in cam follower applications is the Multirol CF series full type roller bearing. This bearing is built especially for the repeated shock loads of typical cam action operations. The outer race section is not only heavy radially but is also martempered to combine maximum toughness with adequate surface hardness for withstanding the punishment of cam applications. The outer ring operates on a full complement of small diameter rollers so the load is evenly distributed over a greater bearing surface. The inner race and flange are made in a single piece with the stud, preventing any possibility of disassembly in operation. Greater accuracy is maintained throughout longer bearing life and, compared with plain bearings, both starting and rolling friction are reduced to a minimum. As a result internal wear is diminished and power requirements of Multirol bearing equipped machines are appreciably lessened.

Load Capacity Comparison

To illustrate the increased capacity of the Multirol CF, here is a comparison between a Multirol CF-1 bearing and a corresponding friction type roller, making use of the maximum permissable bearing pressures in pounds per square inch of projected area. The CF-1 bearing will have a maximum of 2240# while the equivalent friction type roller would have a capacity of less than 400#.

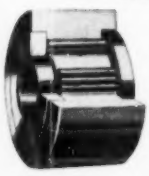
What This Means in Terms of Performance

The James Hunter Machine Co., of North Adams, Massachusetts replaced units consisting of a standard roller bearing and hardened roller with Multirol CF bearings on eccentric cams that actuate rake teeth in their wool washers. The changeover reduced their original and replacement costs over 10% and reduced maintenance to occasional lubrication. Where previously, rollers only lasted a maximum of several months, no replacements have been required with the Multirol bearings. As a result, the Multirol Bearings solved a trouble spot that brought in many customer complaints.



Crown Rheostat and Supply Company of Chicago uses up to 200 Multirol Cam Followers as guide and support rollers in the travel and transfer mechanism of their cleaning, plating, and drying machines. Formerly trolleys were suspended from rails but the cam follower units proved to be a more precision means of friction reduction and added stability to the supporting arms.

Other McGILL® Bearings



MULTIROL CYR

MULTIROL SE

GUIDEROL CT

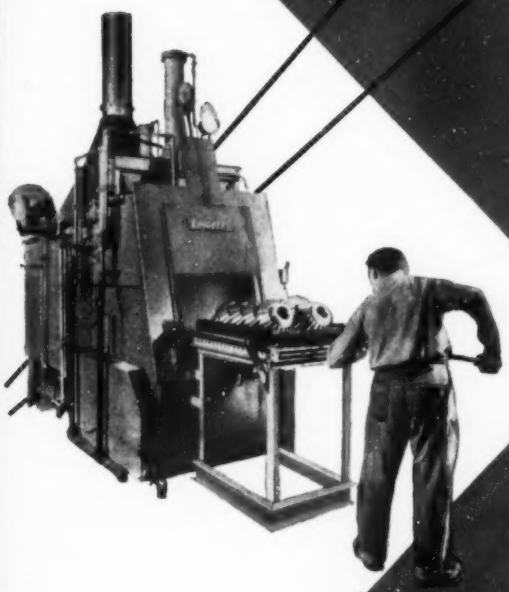
A new 140-page Bearing Reference Guide complete with 30 pages of vital engineering data has just been released by the McGill Manufacturing Company. It has the full story on the advantages of Multirol CF Bearings as well as information on the Multirol CYR, Multirol SE and Guiderol Bearings. Send now for your copy of McGill Catalog No. 52.

McGILL® — Precision Bearings

McGILL MANUFACTURING COMPANY, INC.
300 N. Lafayette Street, Valparaiso, Indiana

5 FURNACES IN ONE

the LINDBERG Carbonitriding Furnace



Yes, it's many furnaces in one! It's designed not only for carbonitriding but also for hardening, carburizing and carbon restoration. It's self contained it's easy to maintain!

10 reasons why Lindberg Carbonitriding Furnaces are better

1. Heating is by new type, gas-fired, vertical radiant tubes. They weigh only 29 pounds each . can be changed in two minutes. Just lift out the old one, and lower the new one in its place.
2. Vertical radiant tubes last longer often two or three times as long.
3. Quench tank is built-in no costly excavation or piping necessary. Distortion is minimized because quenching takes place within furnace structure, and heated work is never exposed to outside air.
4. Quench tank has fin type oil cooler maintains oil at proper temperature for quenching.
5. Specially designed purge chamber purges work loads before they enter heating chamber.
6. Special check-light system tells you where charge is at any given time.
7. Control of heating and quenching cycle is automatic. Uniform case depth is assured because each charge remains at heat same length of time.
8. Depending on your production requirements, Lindberg Carbonitriding Furnaces are made for automatic, semi-automatic, or manual charging.
9. You're not experimenting with Lindberg Carbonitriding Furnaces. They've been tested under three years of rough operating conditions.
10. The famous Lindberg "Hyen" generators which supply atmosphere for Lindberg Carbonitriding Furnaces are instantly adjustable for many different types of atmospheres.

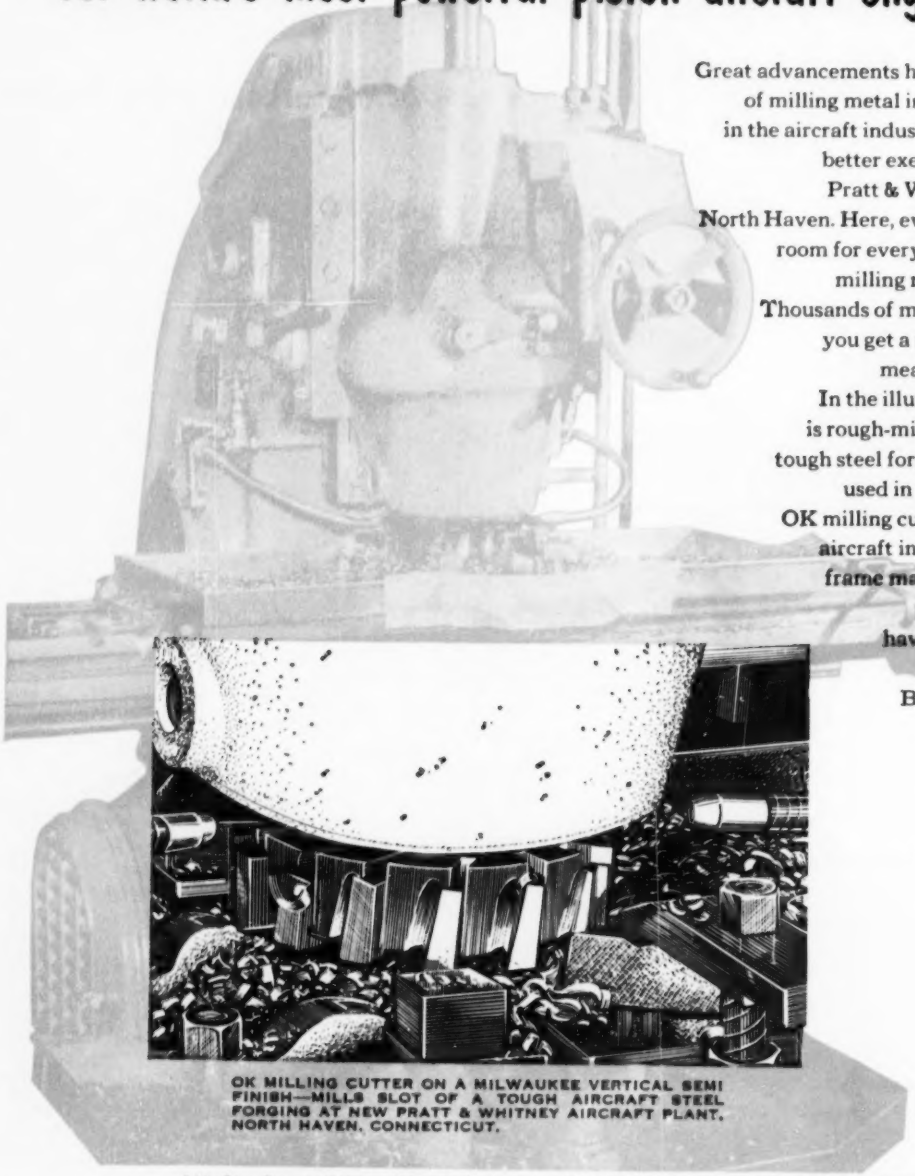
For full details, ask for bulletin #241.

LINDBERG FURNACES

Lindberg Engineering Company • 2445 West Hubbard Street • Chicago Illinois

OK MILLING CUTTERS IN THE AIRCRAFT INDUSTRY—NO. 8

OK milling cutters hogmills centerslot of counterweight forging for world's most powerful piston aircraft engine



Great advancements have been made in the art of milling metal in recent years, especially in the aircraft industry. And, no where is this better exemplified than at the new Pratt & Whitney Aircraft plant at North Haven. Here, everything is ideal. Ample room for every operation. Hundreds of milling machines, all kinds, sizes. Thousands of metals cutting tools. Here, you get a realistic definition of the meaning of close tolerances.

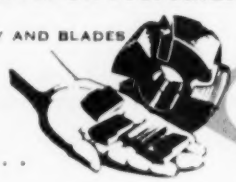
In the illustration, an OK face mill is rough-milling a slot 3/16 x 8" in a tough steel forging for a counterweight used in the Wasp Major engine. OK milling cutters are favorites of the aircraft industry—engine builders, frame manufacturers, component part makers. OK cutters have more beef in the body, are heavier size for size. Blades once driven home, sit secure, unmovable. Mated serrations prevent side-sway and form an accurate measurement for blade advancement to compensate for wear. Mills with this fine adjustment feature reduce grinding to less than .005" per blade.

OK MILLING CUTTER ON A MILWAUKEE VERTICAL SEMI FINISH—MILLS SLOT OF A TOUGH AIRCRAFT STEEL FORGING AT NEW PRATT & WHITNEY AIRCRAFT PLANT, NORTH HAVEN, CONNECTICUT.

Write for OK Tool Catalogs

"MODERN MILLING CUTTERS FOR MODERN MILLING MACHINES"
"AMERICA'S FIRST SYSTEM OF SINGLE POINT TOOLS"

TWO COMPONENTS—BODY AND BLADES
SIMPLE . . .
STRONG . . .
SUFFICIENT . . .

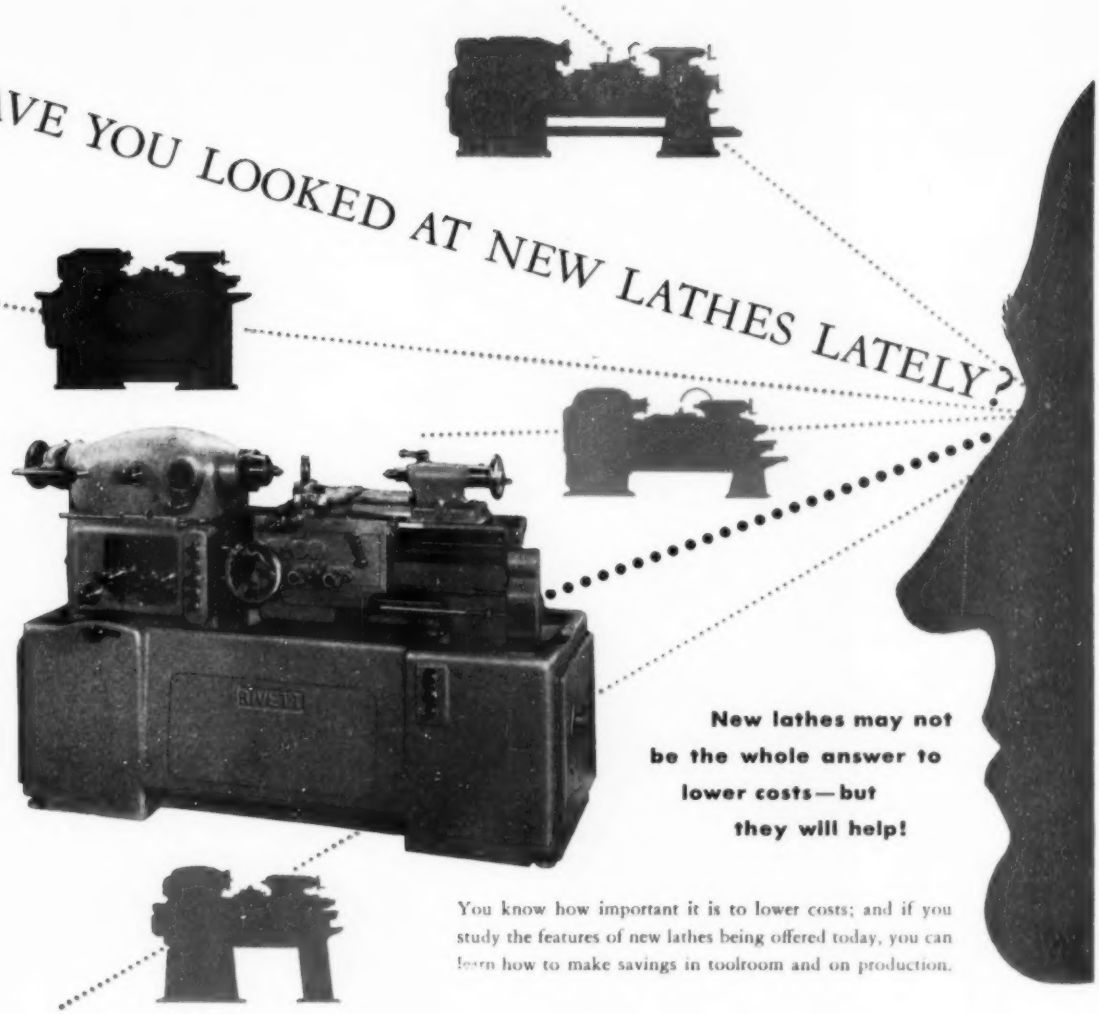


OK

modern milling cutters for modern milling machines

THE OK TOOL COMPANY, INC., Milford, New Hampshire

HAVE YOU LOOKED AT NEW LATHES LATELY?



New lathes may not be the whole answer to lower costs—but they will help!

You know how important it is to lower costs; and if you study the features of new lathes being offered today, you can learn how to make savings in toolroom and on production.

Rivett offers two lathes for one!

This observation is particularly true if you look at the new Rivett Model 1020S Precision Toolroom Lathe. It features sensitivity for turning tolerances within .0004″; and heavy biting ruggedness for a ¼″ cut at .020″ feed in cold rolled steel. In short, it is an instrument lathe and an engine lathe combined to handle any work within its 12½″ swing and 20″ centers.

26 Features Distinguish Rivett 1020S

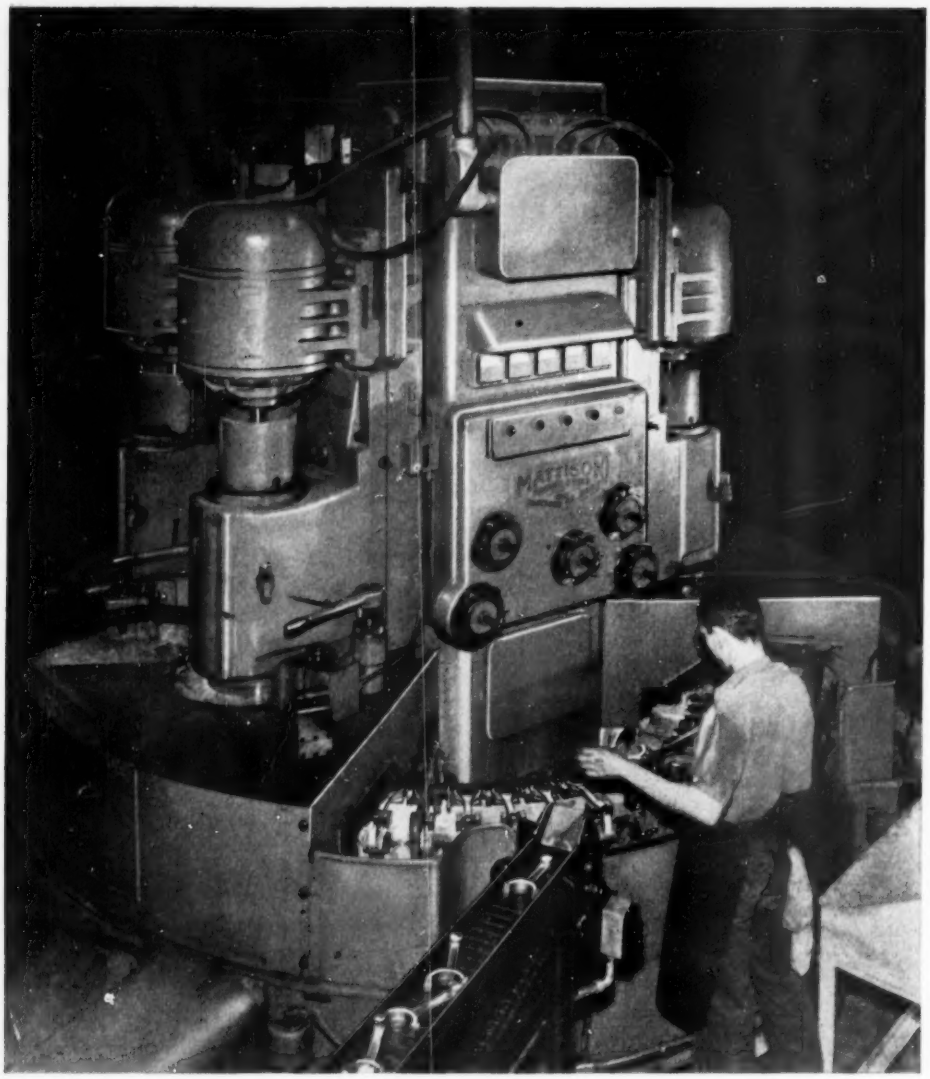
The Rivett Model 1020S is head and shoulders above any ordinary lathe. Its design includes 26 individual qualities that substantiate Rivett's reputation for extreme precision and economical production.

Write for free catalog

Why not write for the new Rivett Catalog 1020B and read these important 26 features—compare them with the designs of other makes of lathes—and thereby realize what a Rivett can do for your shop in the way of time and money (not to mention how happy it will make any *real* machinist to work with such *real* precision!)

RIVETT

RIVETT LATHE & GRINDER, INC., DEPT. AMR 11, BRIGHTON 35, BOSTON, MASS.



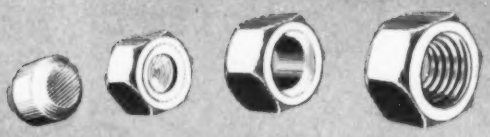
● At the Cleveland Engine Plant of the Ford Motor Company, both sides of wrist-pin and crank-pin bosses are accurately ground on a high production basis with this five wheel Mattison (Hanchett-Type) Vertical-Spindle Automatic Rotary Surface Grinder. Work pieces are held in automatic clamping fixtures. Automatic sizers are constantly in operation checking the work and keeping all pieces within specified tolerances without operator's attention.

This is only one of the many grinders made by Mattison. Whatever your surface grinding problems may be, write us for our recommendations on the proper method and machine for your job.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

Scrapless Nut Wire

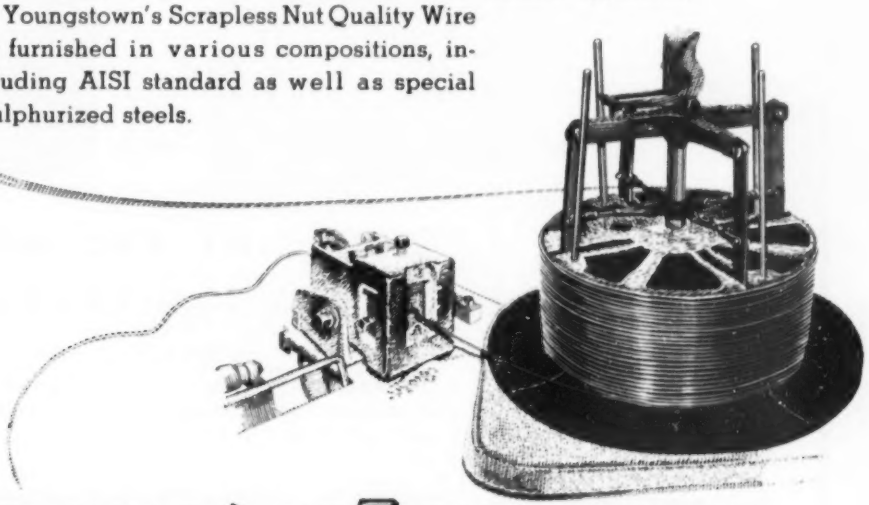
custom built to meet customers' requirements



SCRAPLESS Nut Quality Wire is not an ordinary steel for common applications. It is a custom built product designed to meet customers' specific requirements for cold heading, cold punching, cold expanding and threading, in the production of a variety of nut shapes on continuous heading machines.

Every step of its manufacture is carefully controlled--from the melting furnaces to the final drawing operation on the wire machines. Each coil of wire is subjected to close inspection and rigid tests with modern electrical testing apparatus.

Youngstown's Scrapless Nut Quality Wire is furnished in various compositions, including AISI standard as well as special sulphurized steels.



QUALITY YOUNGSTOWN SERVICE

Youngstown STEEL WIRE

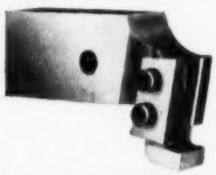
THE YOUNGSTOWN SHEET AND TUBE COMPANY — General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel — Export Office - 500 Fifth Avenue, New York

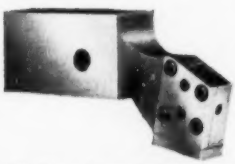
WIRE · COLD FINISHED CARBON AND ALLOY BARS · PIPE AND TUBULAR PRODUCTS · CONDUIT · RODS · SHEETS · PLATES · BARS · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · RAILROAD TRACK SPIKES

GREENLEE *Automatics*

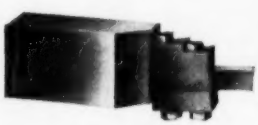
Circular Form-Tool Holder



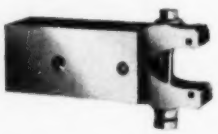
Dovetail Form-Tool Holder



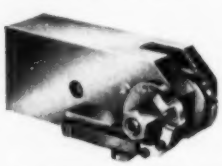
Bit-Type Form-Tool Holder



Cut-Off Tool Holder

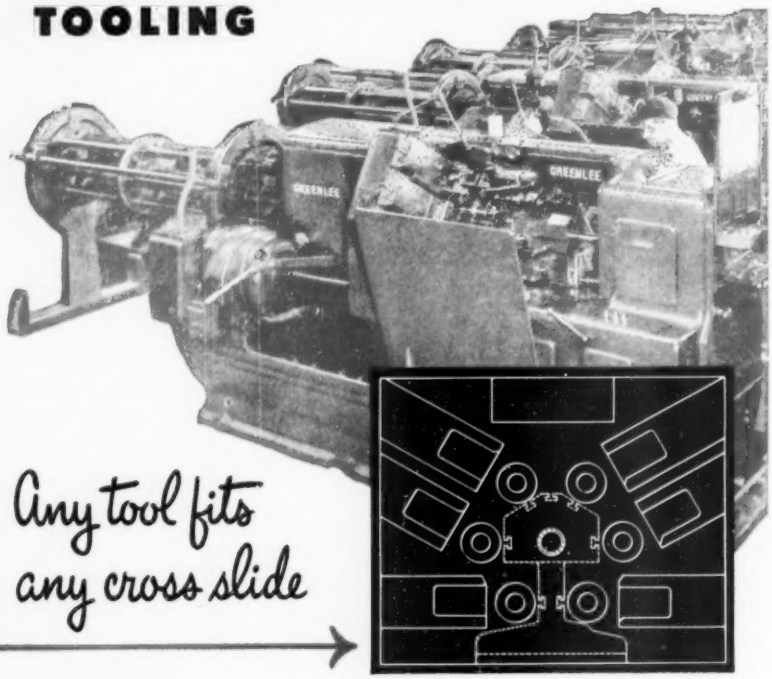


Knurling Tool Holder



Stenciling Wheel Holder

INTERCHANGEABLE TOOLING



Any tool fits any cross slide

SAVE TIME AND MONEY
REDUCE JOB COSTS

Among the cost-saving features of Greenlee Automatics, one of the most advantageous is the arrangement whereby *any* of various standardized tool holders will fit in *any* of the six cross-slides. This means not only no limitations as to what tools can be used in which positions, but also a minimum requirement for investment in tools, and a maximum of speed in tool setting when changing over between jobs. *You can profit* from this and the many other outstanding features of Greenlee Automatics.

Write for FREE Literature

Send today for your copy of our 20-page booklet describing and illustrating all the Greenlee features.

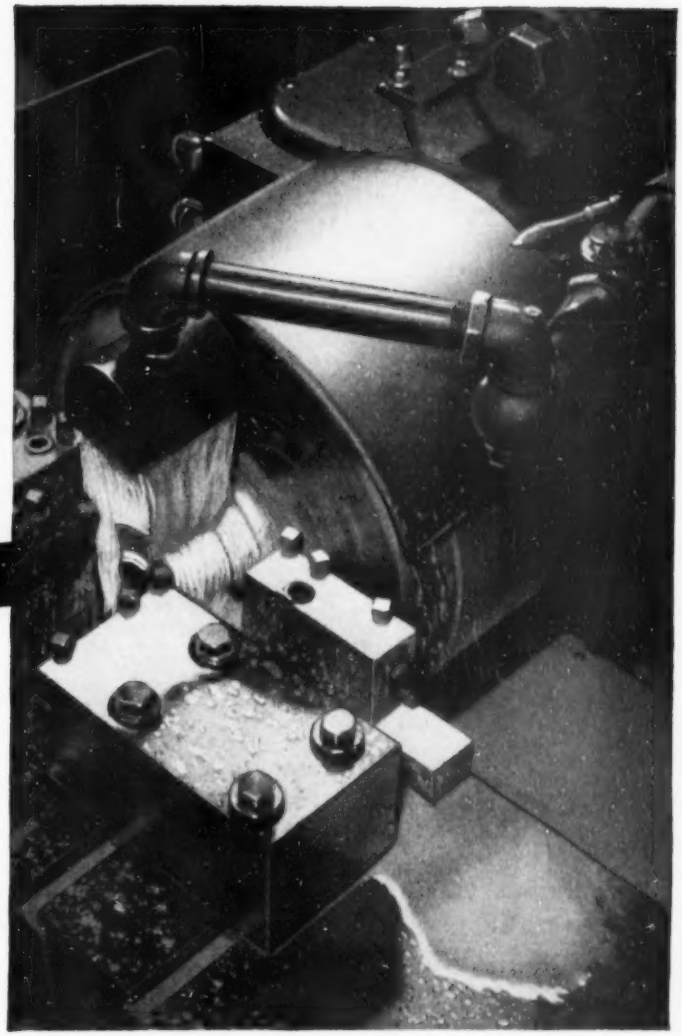
PRODUCTION MACHINERY

GREENLEE

GREENLEE BROS. & CO.
1724 MASON AVE., ROCKFORD, ILL.

YOU BE THE JUDGE FOR DASCO

SUPER SOLUBLE BASE



THE trial of Dasco in many plants has led to this judgment: Dasco Super Soluble Base is a heavy duty water-mix cutting fluid base of unusual versatility. It gives superior performance in mixtures of 1-40 and higher for turning, boring, reaming, drilling and milling and 1-100 and higher for grinding. Only unusual operations may require richer mixtures

TRIAL 1 OPERATION: Turning complete O. D. Nozzle insert for Rockets, B1117 steel

Dasco Performance: One part Dasco Super Soluble Base and 75 parts water on chucking machines increased tool life approximately 35%. Production increased from 50 to 400 pieces in 8 hours. Tool changes decreased from 27 tools per 8 hours using a competitive soluble oil to 12 tools per 8 hours with Dasco Super Soluble Base.

TRIAL 2 OPERATION: Drilling, counterboring and reaming 90MM Projectiles, A.I.S.I. 1055 forgings

Dasco Performance: Number of pieces per set of tools averaged 250 for a rich mixture of competitive heavy duty soluble oil. A 1-20 mixture of Dasco Super Soluble Base produced 500 pieces per set of tools.

TRIAL 3 OPERATION: Internal grinding of steel ring
Machine: Bryant Internal Grinder

Dasco Performance: A 1-150 mixture of Dasco Super Soluble Base replaced a 1-80 mixture of a competitive soluble oil. In addition the competitive product required a rust preventative. Dasco, even at the long dilution, has been in the machine over a month: no rusting has been experienced.

More Than a "Coolant" is Needed

D. A. Stuart Oil Co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS
2729 S. Troy St., Chicago 23, Illinois
In Canada: R. W. Horsey Canada, Ltd.
Subs. D. A. Stuart Oil Co., Ltd.
3575 Danforth Ave., Toronto

SEND COUPON FOR COMPLETE DATA
D. A. STUART OIL CO., Ltd.
2729 S. Troy St., Chicago 23, Illinois

Check One: ☐ Have Stuart Representative Call
☐ Send Data on Dasco

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(Please Print)

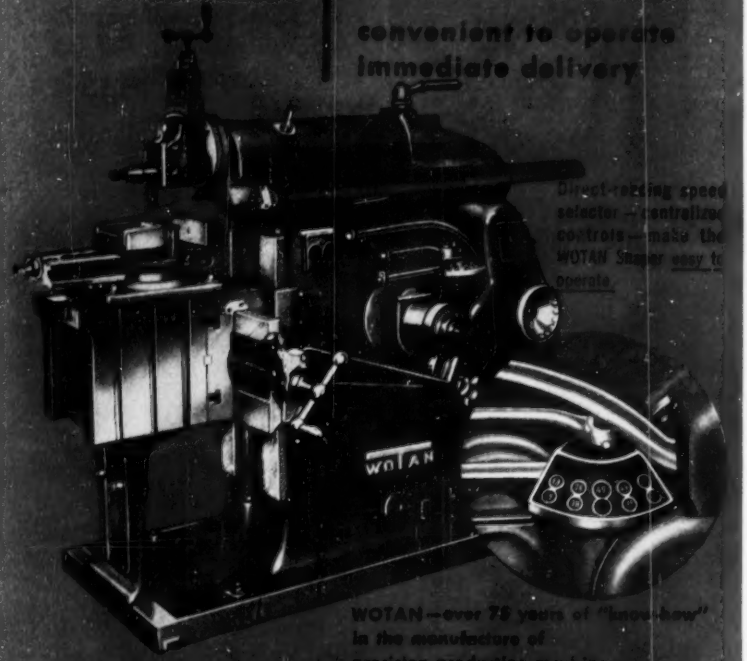
Title _____

Clip to Letterhead and Mail

WOTAN

22" and 16" shapers
for tool room and production

convenient to operate
immediate delivery



Direct-reading speed selector — centralized controls — make the WOTAN Shaper easy to operate.

WOTAN—over 75 years of "know-how" in the manufacture of precision production machinery.

More than 20,000 in use throughout the world.

Favorable manufacturing conditions permit unusually low price, immediate delivery from our Brooklyn warehouse and from dealers' stocks throughout the country.

for full details write, phone, or wire

Parker Machine Company, Inc.

TOOL & CUTTER GRINDERS · ENGINE LATHES · HORIZ. & VERT. BORING MILLS · VERTICAL TURRET LATHES · RADIAL DRILLS

Quick Relief

for
SLITTING SERVICE
Headaches

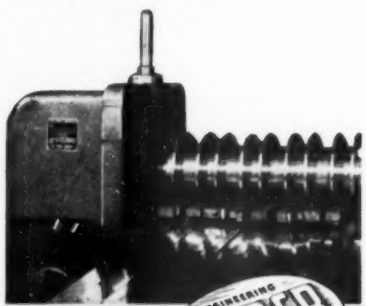
● If your monthly requirements of coiled strip exceed 100 tons, in many different widths and gauges, installing a Yoder slitter will not only result in worthwhile economies but in eliminating costly production bottlenecks.

Coiled strip in standard widths is obviously lower in first cost than slit-to-width strip; the sources of supply are more numerous and deliveries much quicker.

The savings effected by doing your own slitting of moderate tonnages, soon pays for your investment in a Yoder slitter. Equally important, your inventory requirements and production planning are greatly simplified, as you can, from a relatively small stock of standard widths, in a few hours supply your own needs in slit strands.

The economies as well as the mechanics of slitter operation are fully discussed and illustrated in the Yoder Slitter Book, free on request.

THE YODER COMPANY
5519 Walworth Ave., Cleveland 2, Ohio

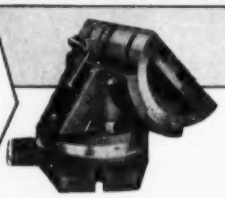


Rotary Gang SLITTERS

ENGINEERING YODER MANUFACTURING

BOSTON UNIVERSAL ANGLE PLATE

A Precision Tool that Holds Work at Any Desired Angle.



Puts Speed and Profit into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Made in several stock sizes.

Write today for full information.

US AUTOMATIC BOX MACHINERY CO., Inc.

40 ARBORETUM ROAD · BOSTON 31, MASSACHUSETTS

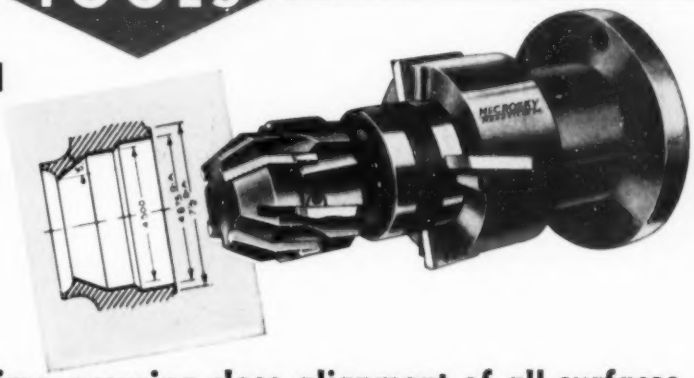
McCROSKY

COST CUTTING TOOLS

Specially Engineered

Multiple Operation

TOOLS



cut machining and set-up time, assuring close alignment of all surfaces, and unsurpassed uniformity and concentricity of finished pieces . . .

Individually engineered to the requirements of each particular job, McCrosky "Specials" combine related boring, facing, chamfering and reaming operations:— do them all at the same time with just one tool and one set-up. McCrosky "Specials" cut costs and practically eliminate spoilage and rejects. They pay their way on short or long production runs.

Use of McCrosky's Jack-Lock and Super-Jack Wedges and other shop-tested features give McCrosky "Specials" the strength and rigidity of solid tools yet permits the blades to be released and adjusted for regrinding easily and quickly,— saving time, minimizing the amount of blade stock ground away, and requiring fewer tools to keep a job running continuously.

Send for Bulletin No. 17-S. It illustrates more than 40 applications of McCrosky "Specials" and will suggest places where you too can use them to turn out better products, quicker and cheaper!

McCROSKY
Universal
MILLING CUTTERS

Body can be bladed to rotate either right or left hand. Consequently, selecting blades with tips of proper material mounted at proper angles produces a cutter that meets any metal or machine condition. Write for Bulletin No. 531 today.

McCROSKY
Super® Adjustable
REAMERS

Complete line includes chucking reamers with straight or tapered shanks, shell reamers with tapered holes for standard arbors or large straight holes for line bar reaming. Stock sizes from 15/16" to 6" diameter. High speed, cast alloy or carbide tipped blades. Write for Bulletin 18-R.

McCROSKY
Jack-Lock®
MILLING CUTTERS

Face Mills, Shank and Shell End Mills, Half Side and Staggered Tooth Milling Cutters fitted with high speed steel, cast alloy or carbide tipped blades. Sizes from 3" to 24" in diameter to meet any requirement. Write for Bulletin No. 17-M.

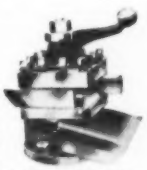
McCROSKY
Block Type
BORING BARS

Individually ground and hardened tapered V-key center the block and cutting blades accurately and rigidly yet permits easy release for regrinding, and "floating" with extreme accuracy when making finishing cuts. Wide range of stock sizes. Write for Bul. 17-B.

McCROSKY
Wizard®
QUICK-CHANGE CHUCKS

McCrosky's Wizard Quick-Change Chuck and Collet outfits hold tools centered and rigid. They enable the operator to change tools easily and quickly, without stopping or slowing down the spindle. Successive operation jobs become continuous. Write for Bulletin 18-C.

McCROSKY
Turret
TOOL POSTS



These tool posts permit successive tools to be swung into cutting position quickly, indexed accurately, and locked rigidly, giving engine lathes many of the advantages of turret lathes. Four styles—11 sizes. Write for Bulletin 17-T.

COST CUTTING TOOLS **McCROSKY TOOL CORPORATION**
MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities

ANACONDA® METALS AT WORK

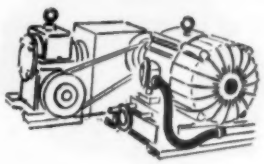
Copper "package" for the coldest products on earth

This container for storing and transporting liquefied helium (—452 F.) or hydrogen (—421 F.) is made by Superior Air Products Co. of Newark, N. J. The secret of keeping heat out to reduce evaporation is four concentric copper spheres separated by a high-vacuum space, a nitrogen protecting bath, and a second high-vacuum space — the entire unit enclosed in a stainless steel casing. Copper contributes ductility and malleability for spinning into hemispheres, unexcelled soldering properties for joining into spheres, and a mirror finish to reduce radiation losses. Need we tell you that it's made of ANACONDA Copper?

This "iron horse" runs on brass

The "High Iron" we're referring to is the HOBBYLINE HO-GAGE model railroad track which John A. English & Co. of Morrisville, Pa., makes of FORMBRITE** strip. This fine-grain, yet ductile forming brass produces a track so strong and stiff it will support an adult's weight. In products where finishing costs count, users find that FORMBRITE usually needs only a color buff to produce a high finish.

Flexible conduit enjoys a splash in a bath



The real trick is to make an electrical conduit that's flexible *and* liquid-tight *and* approved by Underwriters' Laboratories for such applications. SEALTITE* Type UA does all three. Made with a tough synthetic jacket extruded over a flexible steel core, it's shown here protecting wiring to motor in an auto laundry. It ignores not only splashing, but also oil and grease, and resists abrasion. Want more facts?

We put an end to "the bends"

We don't mean the kind deep-sea divers suffer from, but the kind heating contractors had to put up with when they installed radiant panel heating systems. Heretofore, many contractors formed the panel grids on the job by hand-bending them from coils of tubing—a time-consuming, laborious, back-breaking job. Now PG's** have ended all that. They are the new, compactly packaged, accurately *preformed* ANACONDA Copper Tube Panel Grids . . . from the handy carton to installation is only a matter of minutes. PG's are another ANACONDA first.

A service for you

Our Technical Department has a range of experience that covers the entire field of copper and copper-alloy applications in industry. If you have a problem of metal selection, we are at your service. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Trademark
**Reg. U.S. Pat. Off. 5393

ANACONDA® the name to remember in COPPER — BRASS — BRONZE

PACEMAKER 150-T OIL WAS USED
to replace previous oil that was causing deterioration of gaskets and packing of the injection molding machine shown here.

PACEMAKER 150-T OIL SAVES MANUFACTURER UP TO $600.00 PER MONTH

The injection molding machine (shown above) of Plasticks Inc. of Chicago was operating under 1000 p.s.i. at a water-controlled oil heat of 100° F to 120° F, 24 hours per day, 7 days a week.

THEN CAME TROUBLE! The hydraulic oil they were using was seriously damaging gaskets and packing. So, they called in their Cities Service Representative . . . and he recommended Cities Service Pacemaker 150-T Oil.

THE RESULTS WERE PHENOMENAL! With Pacemaker 150-T, the machine was able to run far longer on an oil change than ever before! Machine filters were cleaner with each change. Gumming and deterioration were eliminated! . . . AND DOWNTIME WAS CUT 20% to 25% AT THE AMAZING SAVINGS OF $450.00 to $600.00 PER MONTH!

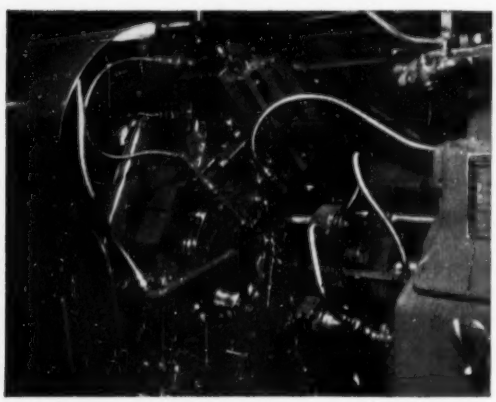
You too can realize big dollar savings and increase production by relying on the full line of Cities Service Industrial Lubricants. Call your nearest Cities Service Representative, or write Cities Service Oil Company, Dept. K-4, Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

Free-Machining ENDURO STAINLESS STEEL BARS ...two Grades

(A.I.S.I. 416 and 430-F)

Fully 90% As Machinable As Bessemer Screw Stock



You can give duplicate steel parts added strength and increased corrosion-resistance . . . and still get economical automatic production. Convert to Free-Machining ENDURO Stainless Steel bars. They're cold-finished by Republic's Union Drawn Steel Division to give you close tolerance, accuracy of section, uniform soundness and fine surface finish . . . plus the high physical and chemical properties of stainless steel. Two grades are fully 90% as machinable as regular Bessemer screw stock. Free-Machining ENDURO is also available in hot-rolled bars and wire. Republic metallurgists give prompt assistance on applications, processing and use. Write:

REPUBLIC STEEL CORPORATION
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Republic ENDURO® FREE-MACHINING STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

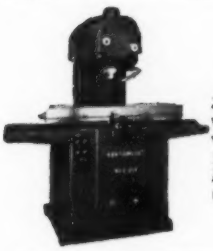
CUT MILLING COSTS WITH

KENT-OWENS

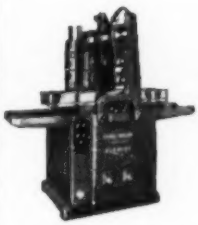
Speed and Accuracy!

No. 2-20
20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.

More and more—Kent-Owens Machines get the call for countless milling jobs today—because they're *rugged . . . simple . . . versatile.* Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to cutter. Write for bulletins on wide range of hydraulic and hand-operated machines. Also, let our engineers help you with tooling and special machine requirements. Kent-Owens Machine Co., Toledo, Ohio.



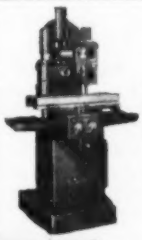
No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M.... 42" x 12" table.



No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel . . . 42" x 12" table.

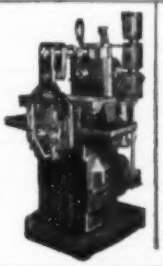
No. 1-14DS
Double Spindle for two milling operations at same time . . . 14" table travel . . . 32" x 9" table.

No. 1-M
Hand feed to table and head . . . 25" x 9" table . . . Adjustable head counter-balance.



No. 1-V
Hydraulic vertical head feed... 5¼" head travel . . . 25" x 9" table.

No. 1-8
8" table travel . . . 25" x 9" table . . . automatic hydraulic table feed.



No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Call on KENT-OWENS for milling machines

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General Machinery Corp.
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Joseph Monahan
HAMILTON, ONT.
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HARTFORD
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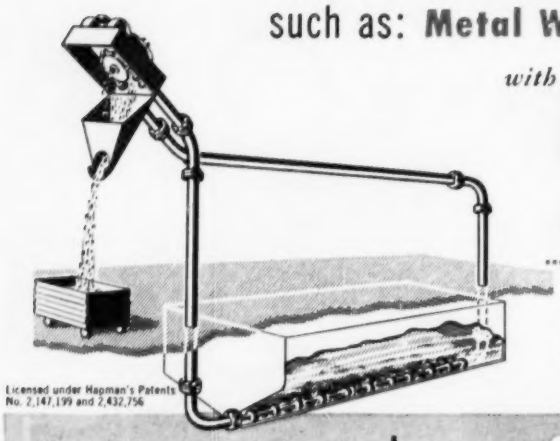
Get automatic LOW COST handling of loose materials such as: **Metal Working Chips • Dust • Scale • etc.**

with

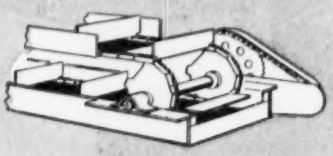
HOUDAILLE
Automatic Conveyors



Licensed under Hapman's Patents No. 2,147,199 and 2,432,756

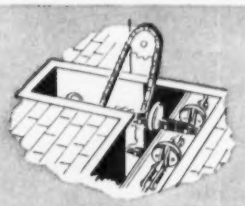
Houdaille Chain Drag Conveyors

Completely enclosed flights and chain automatically collect, transport and discharge chips, sludge, scale and other types of solid or fibrous material which settle to the bottom of tanks or hoppers. Standard pipe sizes — 3", 4", 6", 8". Larger sizes on request. Choice of chains, flights, casings, accessories also available.



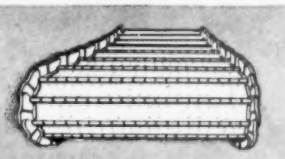
Houdaille Slat Type Conveyors

Slat type trough conveyors, operating individually or in sequence, transport material to any given point—can be operated continuously or intermittently as desired. Slats and chain move material in open troughs, return automatically to collection or transfer points.



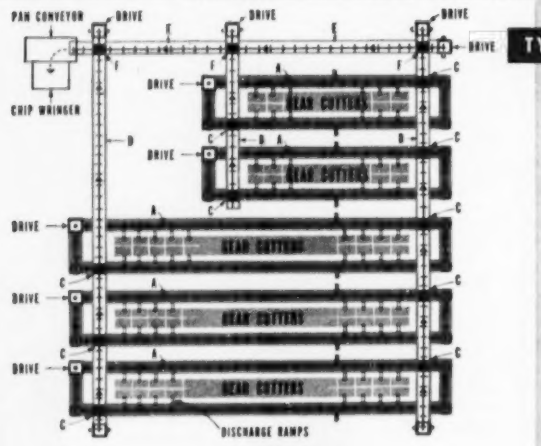
Houdaille Open Trough Conveyors

Chain Drag Conveyors installed in open troughs, running above or below floor level, offer many advantages in different types of operations. Below-floor-level installation, illustrated, continuously removes steel chips from machine tools, keeps system from interfering with heavy traffic plant areas . . . yet offers access to chain and flights at any point of circuit.



Houdaille Pan Type Conveyors

One-piece, heavy-gauge steel plates, featuring all-welded hinge construction, lock together firmly by means of connecting rod to form perfect pan-type conveyor for chips. Welded hinges, rod connections and side wings, securely interlocked even when chain negotiates sprocket or turns, prevent fall-through of material or jamming of conveyor. Plates perforated for drainage, depending on application. Ideal for installation on individual machines or large central chip handling systems.



TYPICAL OPEN TROUGH CHAIN CONVEYOR LAYOUT

Nine 6" Houdaille Open Trough Chain Conveyors operate automatically and continuously to remove steel chips from 500 Gleason Gear Cutters in large automotive plant. Five of the conveyors (A) pick up steel chips deposited into troughs (B) by the gear cutters. Each of the five conveyors services a battery of gear cutters aligned in a double row. Trenches, accommodating the open trough conveyors, wind completely around each double row of gear cutters up one side and down another. Chips empty into the troughs by means of a discharge ramp extending from each gear cutting machine.

Each of the five conveyors discharges chips at two points on their individual circuits (C). Here, three other 6" open trough chain conveyors (D), operating over and under the first five conveyors, collect, transport and ultimately discharge all of the chips into one main 6" open trough chain conveyor (E) at three points (F). At these points the chips are carried along the trough to a pan conveyor which discharges regularly into a chip wringer

NEW COMPREHENSIVE CATALOG

with complete information on all Houdaille conveyors is now available. Write today on company letterhead to...

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205 WABASH AVENUE, LEBANON, INDIANA
a subsidiary of **Houdaille-Hershey Corp.**

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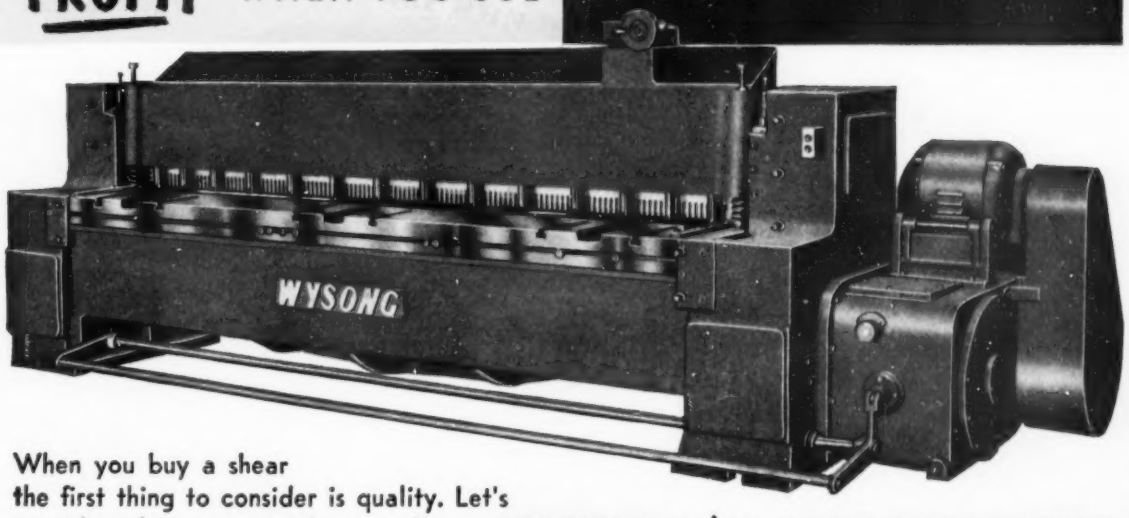
PROFIT WHEN YOU USE

A WYSONG



When you buy a shear
the first thing to consider is quality. Let's
consider what you get when you buy a

WYSONG 1/4" CAPACITY SHEAR

For instance there isn't a quieter or more trouble-free holddown on any shear made.

Fine. But just how much pressure does it provide?

Up to 10,000 pounds, but pressure is easily decreased to prevent marring of sheets.

Can I cut thin sheets and ¼" plate at the same time?

Certainly. That is a matter of blade setting and equalized holddown. Compensating springs in each holddown foot equalize the pressure on materials of different thicknesses and irregular sheets. The blade setting for ¼" gives a good cut on thin sheets.

Do I have to open the gear box to set non-repeat unit?

No. Merely turn knob at front of gear box to "C" for continuous operation or to "S" for single-stroke.

How often must I grease gears and eccentrics?

Those parts and the clutch run in baths of oil. Oil in the gear box should be changed every six months and in the end frames about once a year.

Well, I see it is safe and easy to operate, but does it hold accuracy under the heavy load required to shear full length ¼" sheets?

As close as any shear made. The rigid, massive, Hi-tensile casting construction of Wysong Shears has made them known for maintaining alignment.

Do I have to buy the motor and starter as extras?

No. Wysong furnishes them, mounted and wired for operation.

How much extra does the front-operated back gauge cost?

Not a cent . . . it's standard equipment. The price also includes solid, four-edge blades, a nine-jaw clutch with non-repeat unit, metal finger guard and belt guards.

NATIONAL MACHINE TOOL BUILDERS ASSN. MEMBER

For better quality and greater value join the many satisfied users who say . . . "for Shear satisfaction . . . buy a WYSONG . . . it's MILES ahead". See your dealer or write to factory.

WYSONG

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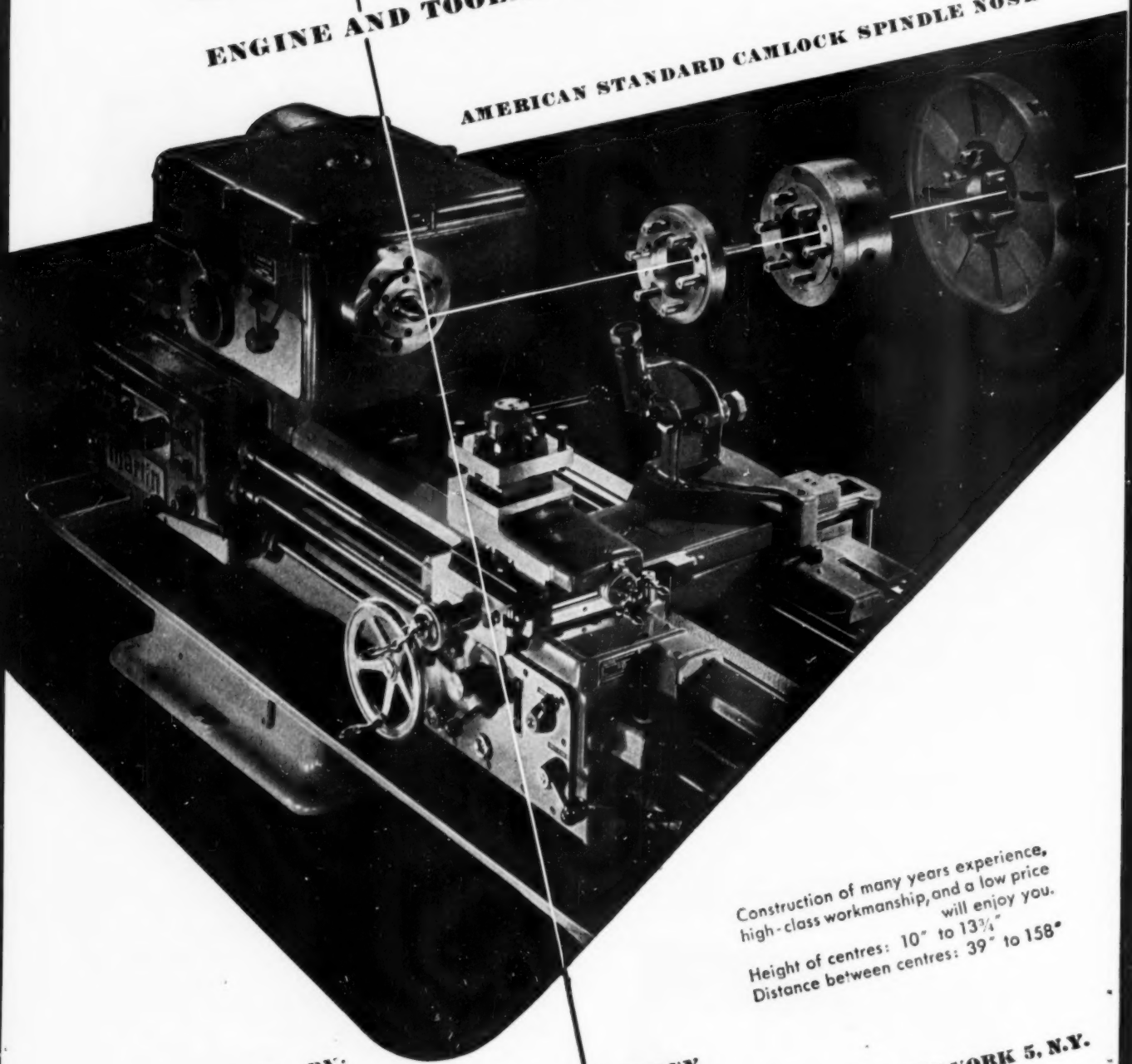
ENGINE AND TOOLMAKERS LATHES TYPE DL 500

AMERICAN STANDARD CAMLOCK SPINDLE NOSE



Construction of many years experience, high-class workmanship, and a low price will enjoy you.

Height of centres: 10" to 13¾"
Distance between centres: 39" to 158"

MANUFACTURED BY:

K. MARTIN

MACHINE-TOOL-WORKS OFFENBURG WEST-GERMANY

SOLE AGENT FOR USA: TRANSMARES CORPORATION 15, WILLIAM STREET, NEW YORK 5, N.Y.

Early Deliveries

A Century MOTOR With Gas Mask PROTECTION

Underwriters Approved

EXPLOSION PROOF MOTORS

Take a look at these Century Explosion Proof Motor features:

- Vital motor parts protected—sealed into inner frame.
- Motor can be reversed without changing direction of the fan—fan runs in either direction.
- Uniform ventilation surrounding outside of inner frame.

- Smooth, straight-through ventilating passages.
- Winding electrically insulated 6 different ways.
- Unusually free from vibration.
- Ball bearing housing keeps grease in—dirt out—lubricated for several years' normal service, with grease plugs for additional lubrication, if necessary.

- Easy-to-remove fan guard is held securely in place with two screws.
- Smooth exterior surface is easy to clean.
- Cast iron frame with integrally cast feet resists rust and corrosion—even when mounted in places where processed materials may contact the feet.

- Rugged construction gives generous safety factor for rough handling.

CE-760

Your property and employees are protected, because this Century Explosion Proof motor is totally enclosed—sealed to prevent a motor spark from causing an explosion.

Class I, groups C and D are used in atmospheres containing flammable gases or vapors: Ethyl ether vapors, gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors and natural gas.

Class II, groups E, F and G are used in atmospheres containing combustible dusts: Metal dust, carbon black, coal or coke dust and grain dusts.

Naturally, corrosive or abrasive materials in the air are also sealed out of the vital parts.

For your protection, specify Century motors on new equipment or for replacement. Your nearby Century Distributor will be glad to give you full information on the complete line of Century motors—from 1/8 to 400 horsepower. We are limited in some sizes of the Explosion Proof motor.

Century C MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Good Machinability
Good Heat-Treating Properties
High Cold-Drawn Physical Properties
Wide range of applications
Supplied Cold-Drawn
Supplied Cold-Drawn with metallurgical processing including special tempering
Typical Analyses found in AISI 1100 Series
Backed by J&L steel-making know-how
The original open hearth free-machining steel
Let's get down to the point
You can make better parts with J&L Jalcase Cold Finished Steel
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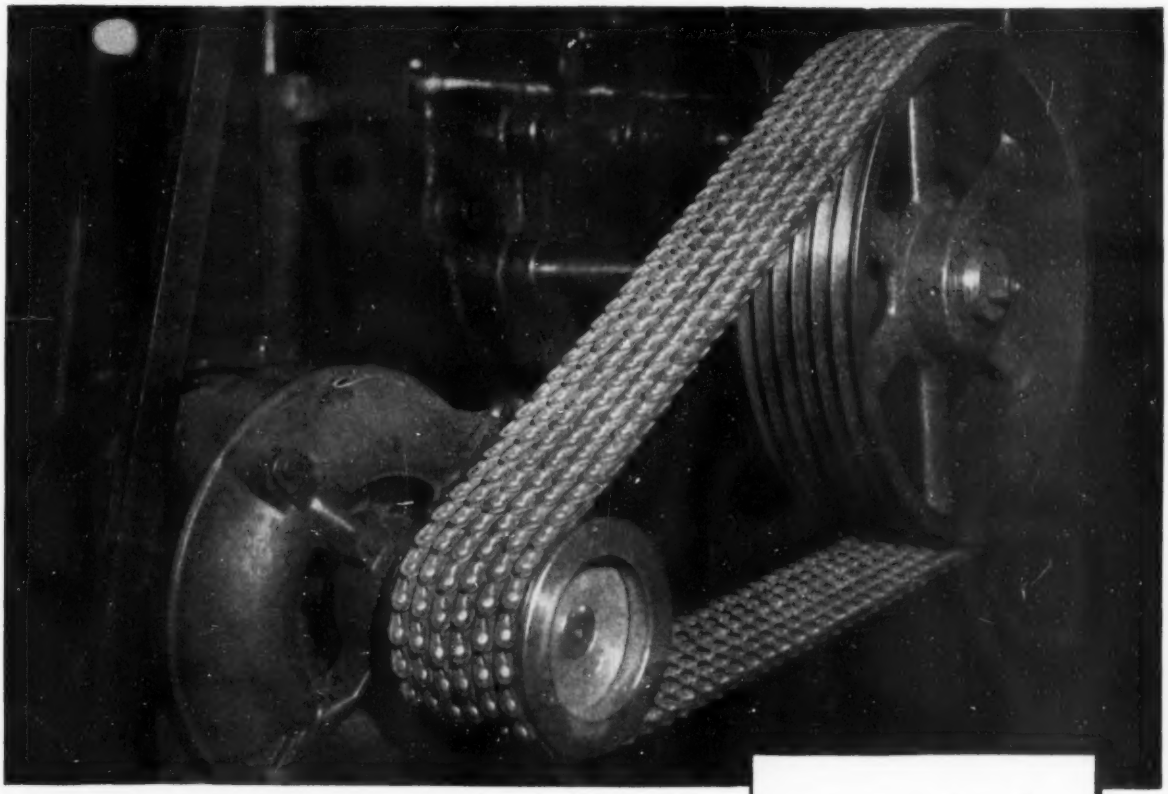


with Veelos on your machines...

v-belt adjustment is a production-saving job

All v-belts stretch—but with endless v-belts there's nothing you can do to take up this stretch once the motor has been completely "run-out". With Veelos it's another story! The adjustment is in the belt itself—even sliding motor bases are unnecessary.

Changing the length of each Veelos v-belt by just adding or removing links is the best, most efficient, way to keep the belts correctly matched. Using Veelos means that the job of adjustment is done easily and quickly . . . at a fraction of the cost of replacing with new belts.

Veelos, the adjustable v-belt, provides vibrationless, full power delivery. It is easier to stock and control because it is packaged on 100-foot reels in every standard width. And Veelos can be adjusted or made up in correctly matched sets with the least amount of machine down-time—at production-saving speed!

Have you seen this Veelos Facts Book?

Your Veelos v-belt distributor's salesman will be glad to give you a quick trip through this fact-packed, 36 page book. You'll find it well worth the few minutes it takes. Next time the salesman calls, ask him to show it to you.

VEELOS
THE LINK
V-BELT

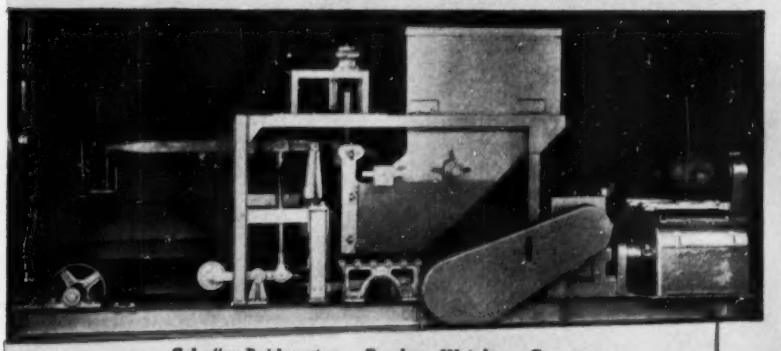
Write today for your copy of the Veelos Data Book—it is a completely illustrated, 28-page catalog that gives file-worthy product and engineering facts which you should have handy. We'll be glad to send you a copy at once.

MANHEIM MANUFACTURING AND BELTING COMPANY
601 Manbel Street, Manheim, Penna.

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

SCHAFFER POIDOMETERS rely on CLARK CONTROL for accurate feeding, weighing and conveying

CLARK Type "CY" Starters *are basic units in Control System*



Schaffer Poidometers—Feeder—Weigher—Conveyor

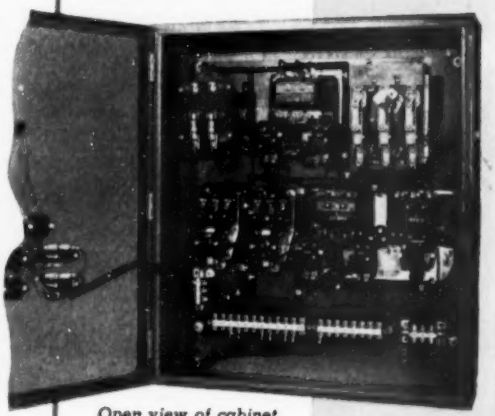
Closed view of Clark Control Cabinet

Dependable, accurate control is essential on poidometers designed to deliver materials to machines or process operations in exactly correct amounts.

The Schaffer poidometer illustrated is one of four which feed clinker and gypsum in lump state to a ball mill for pulverization. The CLARK control panel incorporates controls for two motors—one operating the conveyor belt at a fixed travel speed, the other operating the hopper gate. A weighing beam actuates limit switches, causing controlled motor to move gates up or down, to keep proper weight of material flowing.

When two or more poidometers are used for proportioning materials, controls are provided so that stoppage of one machine automatically stops the others to prevent improper proportioning.

CLARK Type "CY" AC Motor Starters are ideal for this and other control applications where accuracy and dependability are requisites. The new arc-quenching principle, which forces the arc to move continually from a hot to a cold spot on contact surfaces effectively reduces contact wear—thus providing less down time and longer life.



Open view of cabinet

These and other important exclusive features of CLARK Type "CY" Starters can improve the efficiency of your machines. Let us show you how.

THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL • 1146 EAST 152ND STREET, CLEVELAND 10, OHIO

Precision Boring *plus* Milling On 1 Machine!

KNIGHT'S NO.

50

Precision Boring & Vertical Milling Machine

Accurate—powerful—fast—this versatile solid-base machine will handle an extreme range of difficult and unusual boring or vertical milling work that normally requires the use of 2 or more single-purpose machines. *Here's what that means to you . . .*

1. Work transfers are entirely eliminated
2. Set-up time is reduced by half or more
3. Greater output is obtained in much less time
4. Fewer manhours and lower cost on every job

A 7½ H.P. all-gear drive provides ample power for the toughest jobs. Convenient quick-action controls and full-vision work areas make operation simple and effortless. Extra-rugged construction promises greater precision, less maintenance, longer service.

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SPECIFICATIONS

- Table travel — Longitudinal 28"; cross 18"
- Vertical capacity — 28"
- Table feeds — Dial type, 16
- Table feeds — per minute, 5/16" to 20"
- Table rapid traverse — Both directions 100"
- Spindle speeds, 16 — 40 — 2000 R.P.M.
- Boring feeds — Infinitely variable, .0005" — .010"
- Horsepower, 7½
- Weight, 8100 Lbs.

KNIGHT VERSATILE MILLERS BUILT-RIGID

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Send catalog on No. 50 and other Knight Milling Machines.

Name .....

Title .....

☐ Send information on Knight's 20" and 42" Rotary Tables.

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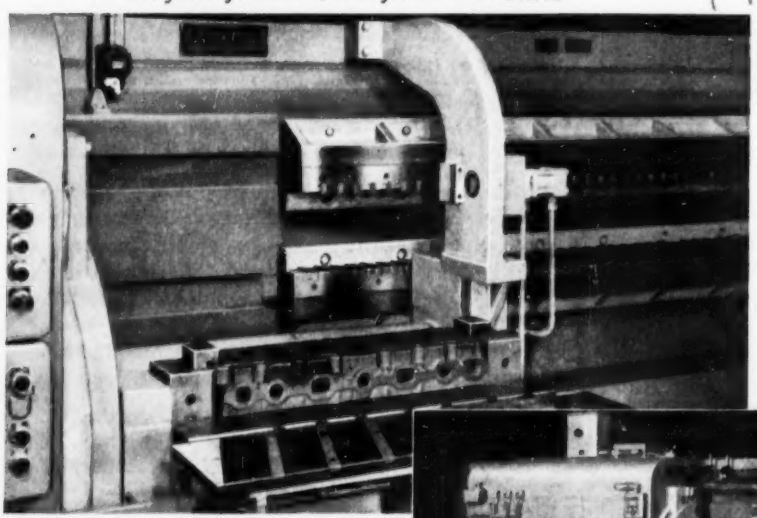
Leading the field in broaching machine design and engineering, LAPOINTE'S radical, new

ELECTRO-MECHANICAL DRIVE horizontal BROACHING MACHINE

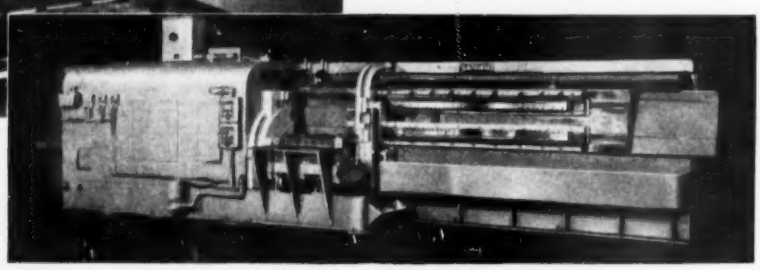
is already performing production miracles in automotive plants. Broaching speeds of 50 to 150 feet per minute are practical with conventional type broaches, but carbide-tipped broaches can be used when taking advantage of the machine's amazing broaching capacity up to 300 feet per minute . . . and more!

For full information, send for Bulletin **SRHE-2**

resulting in BIG SAVINGS for you!



Operating entirely without vibration or chatter, this Lapointe SRHE Broaching Machine, 50 hp, 150-inch stroke, removes 3/16" stock per surface on the manifold face and opposite pads on cast iron *Cylinder Head* parts. Return speed is 150 feet per minute. Yield is 120 completed parts per hour at 80% efficiency. This lack of vibration results in *longer tool life* of 100% or more!



The exclusive Lapointe "Tilt-In" Fixture and work holder are hydraulically operated in synchronism with the broach assembly travel, so there is no delay awaiting the return stroke.

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
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THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

ELGIN'S "Layers of water"

PRODUCE A BETTER ABRASIVE

Water . . . an important ingredient for segregating the tiniest diamond particles in a unique Elgin process . . . a vital step in producing a precision abrasive! After pure diamond bort has been shattered and mechanically sieved into 10 grades, the finest sieve grade is placed in a large glass vessel of pure water, mixed into a slurry and allowed to settle. The heavier, larger particles sink faster . . . forming cloudy "layers" suspended in the water. At specified intervals, an Elgin-developed process removes these "layers of water", thus segregating the various weights of diamond powder while still in suspension. The result is absolute particle uniformity . . so necessary in producing a precision abrasive for precision finishes.

Every step of production, from crushing and grading to the finished DYMO product, is performed in Elgin laboratories under the strictest quality standards. Where only the finest, most reliable abrasives can be used . . . be sure to FINISH WITH DIAMOND . . . ELGIN DIAMOND!

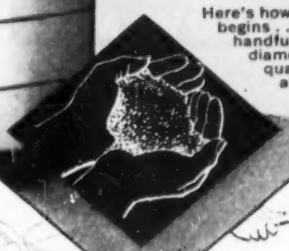
Ask for a free demonstration!

ABRASIVES DIVISION

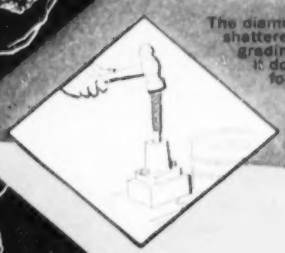
ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

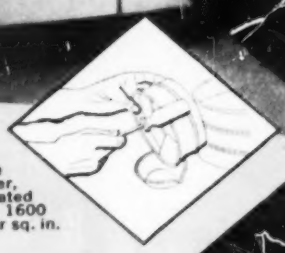
Dept. B



Here's how all Elgin Diamond begins . . . in an $8,000 handful of pure, virgin diamond bort, the finest quality obtainable for abrasive production.



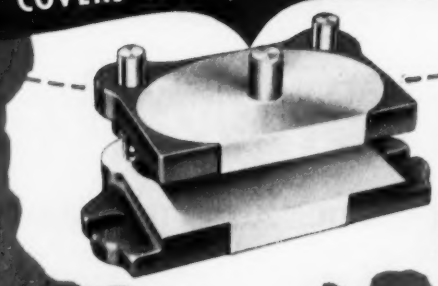
The diamond bort is shattered at the start of the grading process . . . breaking it down into fine particles for further separation.



A special "shimmy" machine vibrates the diamond powder, separating it into 10 graduated sieves with meshes from 1600 to 105,625 openings per sq. in.

Following the "layers of water" process, a final inspection checks the graded diamond dust for correct particle size and grade . . . ready for compounding into its vehicle.

DETROIT DIE SET SERVICE
COVERS INDUSTRIAL AMERICA



YOUR
"DETROIT" DIE SET MAN
CAN HELP YOU

Your "Detroit" Die Set man knows die sets. Call him in . . . talk over your die set problems with him. Get from him full facts about the accuracy of "Detroit" parallel surfaces, the trueness of pins, the fine finish, the thorough inspection at the factory. You'll see that "Detroit" leaves nothing undone to assure easier mounting and longer production runs. Call your "Detroit" man.

CALL "DETROIT"

DETROIT	TR 2-8150
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DALLAS	TE 3818
DAYTON	HE 3042
INDIANAPOLIS	HU 5604
LOS ANGELES	AD 7251
MILWAUKEE	GL 3-7170
MINNEAPOLIS	PR 1822
MONTREAL, CAN.	WI 1186
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NEWARK	MA 2-4318
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PHILADELPHIA	VI 4-4084
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ROCK ISLAND, ILL.	RI. 8-2814
ST. LOUIS	FR 6811
SEATTLE	SE 7997
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DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

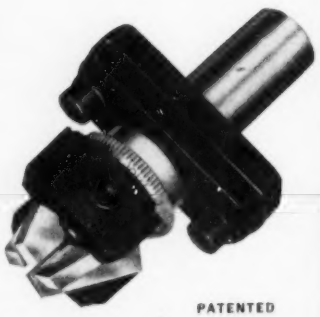
KUTMORE ADJUSTABLE HOLLOW MILLS

NEW! available NOW!

The Midget Floating Holder Hollow Mill, flange type, with micrometric adjustment, designed to permit easy compensation for any spindle misalignment.

WRITE TODAY FOR
CATALOG No. 20AM

It shows complete line of adjustable hollow mills. Our Engineering Dept. is at your disposal for special requirements.



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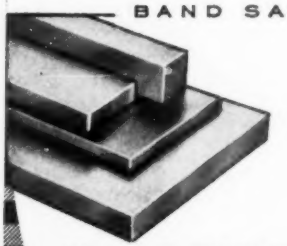
CARL WIRTH & SON, INC. 1625 CLINTON AVE. NO. ROCHESTER 5 N Y

LENOX
QUALITY TOOLS

HACK SAWS

BAND SAWS



GROUND FLAT STOCK

HOLE SAWS

QUALITY LENOX TOOLS

"The Tools in the Plaid Box"

AMERICAN SAW & MFG. COMPANY
SPRINGFIELD, MASS.

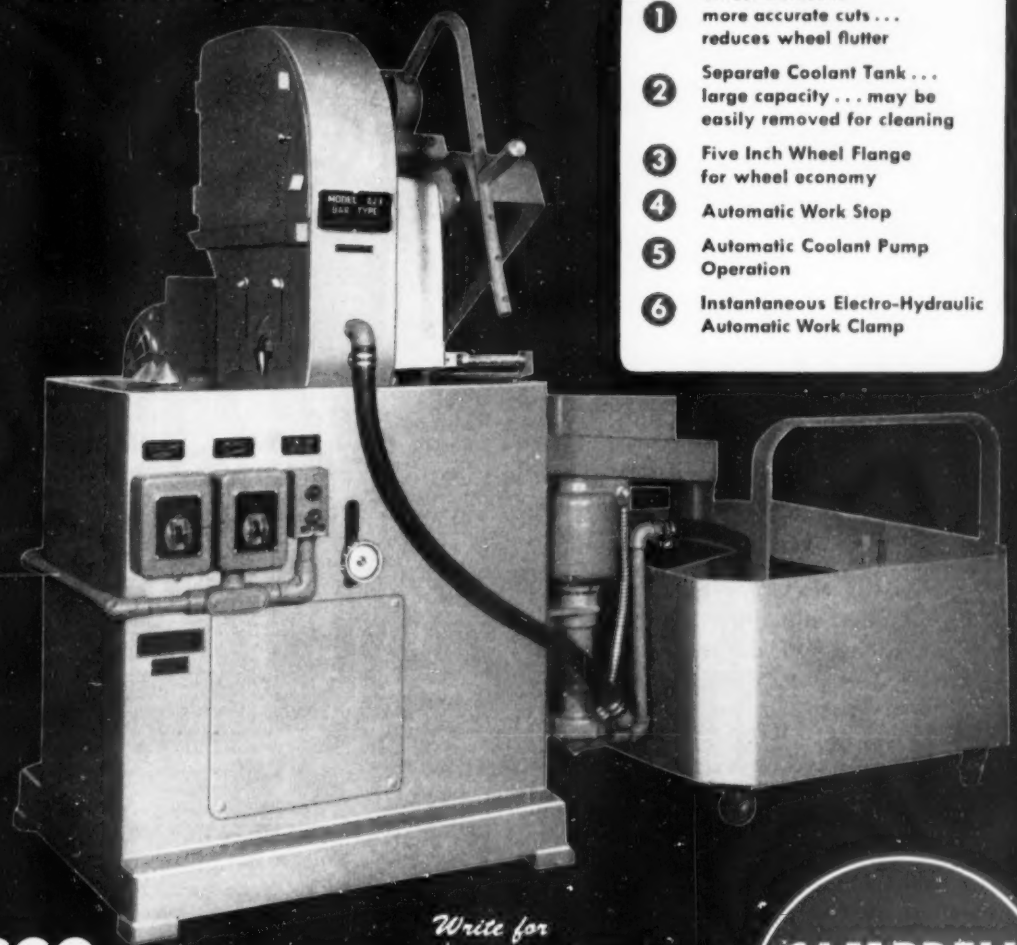
ACCO products

CAMPBELL Abrasive Cutters

New... Low Cost

No. 223 Wet Abrasive Cutting Machine

Fast, clean, close tolerance cuts of hardest alloys and all other metals. Won't work-harden material.



FEATURES

1. Wheel Guides for more accurate cuts... reduces wheel flutter
2. Separate Coolant Tank... large capacity... may be easily removed for cleaning
3. Five Inch Wheel Flange for wheel economy
4. Automatic Work Stop
5. Automatic Coolant Pump Operation
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Write for "Principles of Abrasive Cutting"

ACCO

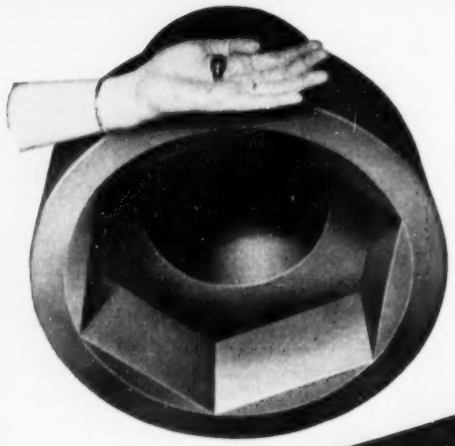
TRADE MARK

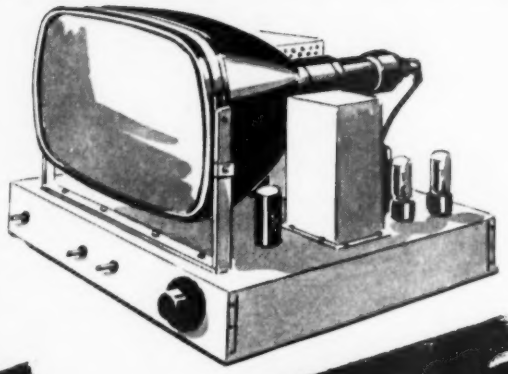
CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

923 Connecticut Ave., Bridgeport 2, Conn.

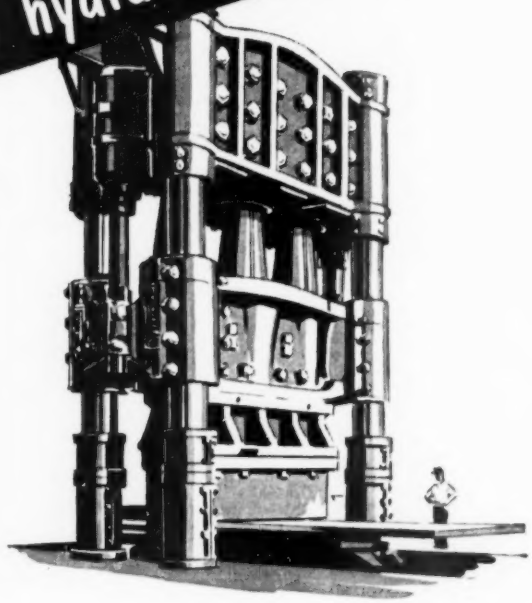
CAMPBELL
Abrasive Cutters and Nibblers

APEX - specialists in nut running





from television to hydraulic presses



APEX sockets fit the job!

Apex straight sockets, weighing less than an ounce, are used to run 3/16" hex nuts in assembling TV sets.

Apex straight sockets, weighing up to 237 pounds, are used to run 10⅝" hex nuts in maintenance work on hydraulic presses.

Between these two extremes are more than 5,000 stock types and sizes of Apex sockets, extensions, adapters and universal sockets, among which you should find several exactly fitted to your requirements. If not, then Apex can most likely build the specials you need.

Either way, stock or special, you're sure to save time and money on nut running operations when you use Apex nut running tools.

CATALOG 29—lists the complete line of Apex nut running tools. Write, on your company letterhead, please, for your copy. For specials, send sketch or blueprint for prompt quotation.

APEX TOOLS

sockets, extensions, universal sockets

THE APEX MACHINE & TOOL COMPANY

1025 S. Patterson Blvd., Dayton 2, Ohio

Alemite "Friction Fighters"

save $2000 a year for steel company!

...add 30 minutes' operating time daily, end bearing failures and lubricating hazards

A mammoth traveling crane carrying tons of steel making constant stops and quick returns. Here—friction's wear and tear posed a costly problem in bearing replacement. Shutdowns were frequent. Delays cut into operating time.

To end this problem once and for all—plant engineers called in an Alemite "Friction-Fighting" specialist. Specific requirements were discussed in detail. Past difficulties were reviewed. Recommendations were made, and an Alemite Mechanized Lubrication System was installed.

This action brought immediate four-way savings: Eliminating lubrication down-time added 30 minutes daily productive use of the crane—time worth $9 a day, $2000 per year. 60% less grease was used. Expensive bearing replacements were eliminated. Also, the 60 foot climb to lubricate out-of-the-way bearings in dangerous locations was eliminated.

Conquering friction is Alemite's business—cutting costs, decreasing down-time, increasing profits. An Alemite Lubrication Engineer can show you ways of making savings. Contact your local Alemite Distributor now.

Alemite—the great name in lubrication serves the great names in industry

Wherever metal touches metal, wherever you find machinery in motion, you're most likely to find Alemite Lubrication and Lubrication Systems on the job. Here are but a few of the industrial leaders who use Alemite.

Eastman Kodak Company • Procter & Gamble
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A PRODUCT OF SW STEWART-WARNER

ALEMITE

35 Years of Lubrication Progress

Alemite "Oil-Mist" Lubrication—another amazing "Friction-Fighting" Development

This most efficient, continuous, fully automatic system in all the field of machinery lubrication atomizes oil into mist—distributes it through tubing to bearings—bathes *all* bearing surfaces with a fresh, clean, cool oil film. Cost of machinery lubrication is cut materially. Human element eliminated.

Please send me **FREE** *New Booklet*

☐ "11 Ways to Cut Production Costs."

☐ Include Facts on "Oil-Mist"—the amazing new system that atomizes oil, circulates it to bearings under pressure.

ALEMITE, Dept. C-113
1850 Diversey Parkway, Chicago 14, Ill.

Name .....

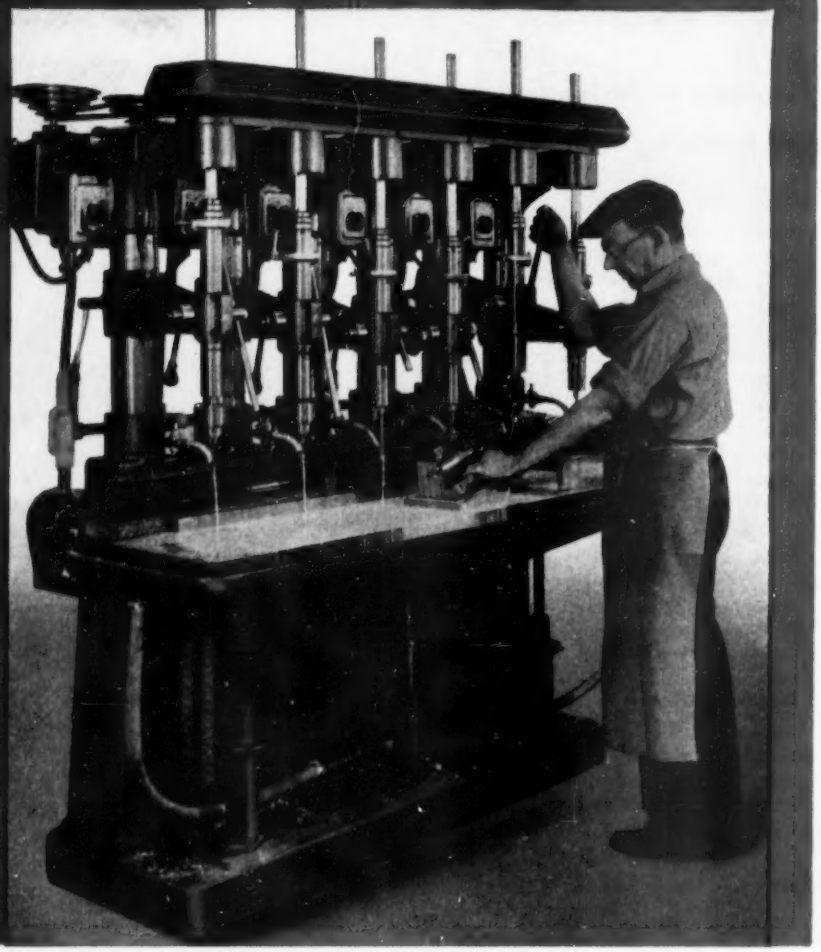
Company .....

City ..... State .....

"Buffalo"

Tips on Better DRILLING

How to Let a Worker Turn Out *More Work -Easier!*



"Buffalo" No. 16
Six-Spindle Drill

Yes, sometimes it's a case of "letting" a worker step up his turnout! Sometimes an awkward, outdated machine is holding him up. Take the machinist above. He's drilling and tapping precision parts on a "Buffalo" No. 16 Drill. The sliding heads are readily adjusted to just the right level for comfort all shift long. The table is easily adjusted for different jigs and work pieces, and the six spindles enable him to keep that many setups in operation for real time savings. That's the way "Buffalo" Drills are designed—from the point of view of the man who runs them. And the No. 16 is just one of eight types of "Buffalo" Drills for any type of drilling. Write us about YOUR drilling problem—the right "Buffalo" Drill may well be the answer!

"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

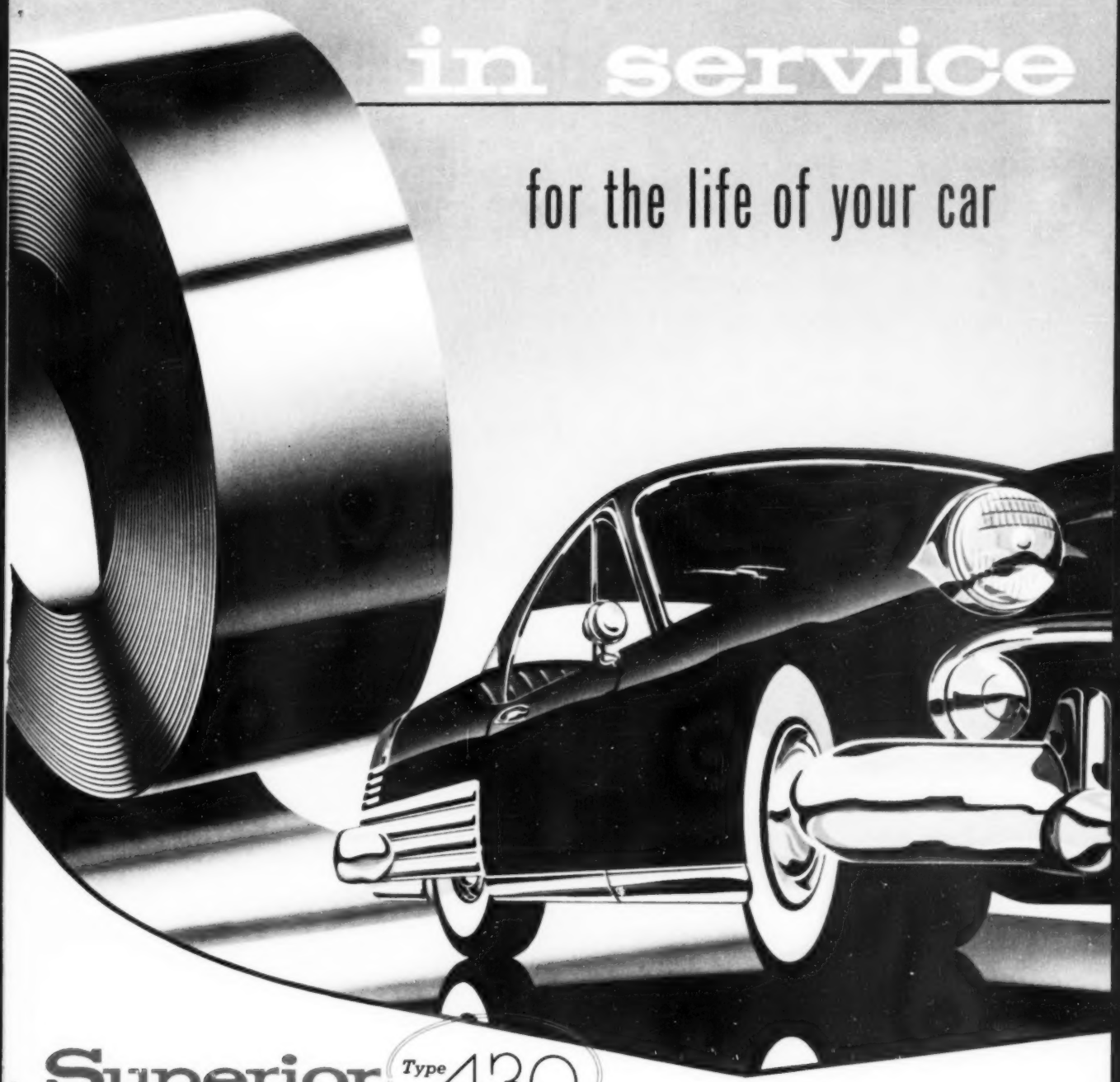
509 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co, Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

beauty in service

for the life of your car



Superior Stainless *Type* 430 strip steel

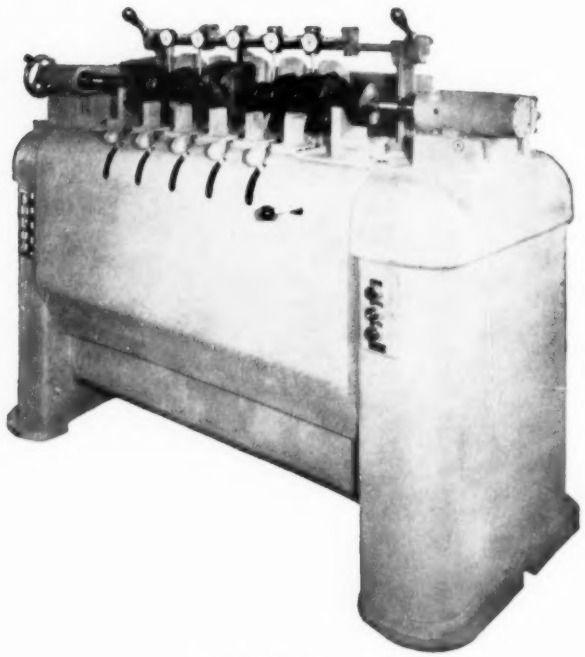
SUPERIOR STAINLESS STEEL cuts down care on the modern car. Where exposure's greatest, Superior Stainless serves the brightest . . . defying rust, peeling, rubs and scrapes because it's *solid* clear through. • Foremost automotive fabricators choose Superior Type 430 Stainless Steel for every workable reason. *Let us serve your requirements.*

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

Impco Straighteners

Tailor-Made and Precision-Built For

- **CRANKSHAFTS**
- **AXLE SHAFTS**
- **CAM SHAFTS**
- **ROCKER ARM SHAFTS**
- **TRANSMISSION SHAFTS**
- **OTHER PARTS OF THIS TYPE**

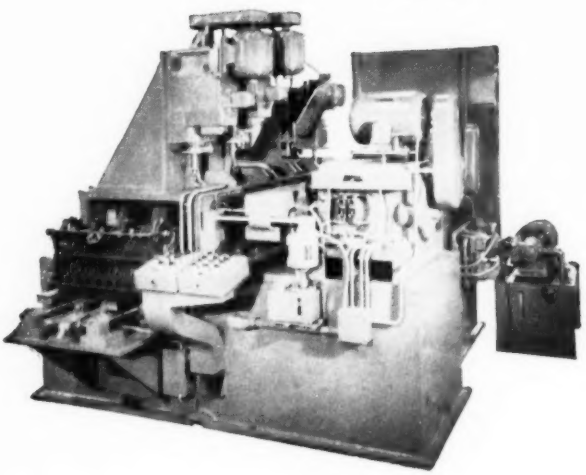


IMPCO Shaft Straighteners incorporate a new principle which straightens shafts by pulling downward instead of pressing the point of runout. A battery of dial indicators makes it possible to locate IMMEDIATELY the amount of greatest runout. These indicators, which can be mounted on a common swivel bracket or on anvils with ample over-travel, are so located that they will not be harmed by loading or straightening of the part.

ALL IMPCO Straighteners are driven by means of a hydraulic double vane rotary cylinder. A convenient filler and large cleanout for the hydraulic oil tank are located on the back side of the machine. Moving parts are encased below the working surface for greater safety and compactness. Tailor-made to customer specifications, IMPCO Straighteners are designed to meet special production needs with consistent accuracy, speed, and efficiency.

CUSTOM-BUILT MACHINES to Fit Your Needs

This automatic transfer machine used for drilling, tapping, and trepanning, was built to specification for a leading automobile manufacturer. It handles 60 cylinder blocks per hour net. We offer it as one example of how IMPCO can solve a particular machine problem. Remember, IMPCO will design plans for you, work from your own prepared specifications, or modify existing machines to meet your specific needs.



For Further Information
Contact Your Nearest Sales Representative
Or Write Direct to Company

Joseph O. Gangler Company
22750 Woodward Avenue—Room 305
Ferndale, Michigan

Stong Carlisle & Hammond Co.
1392 West 3rd Street
Cleveland 13, Ohio

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Toledo 2, Ohio

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Indianapolis 5, Indiana

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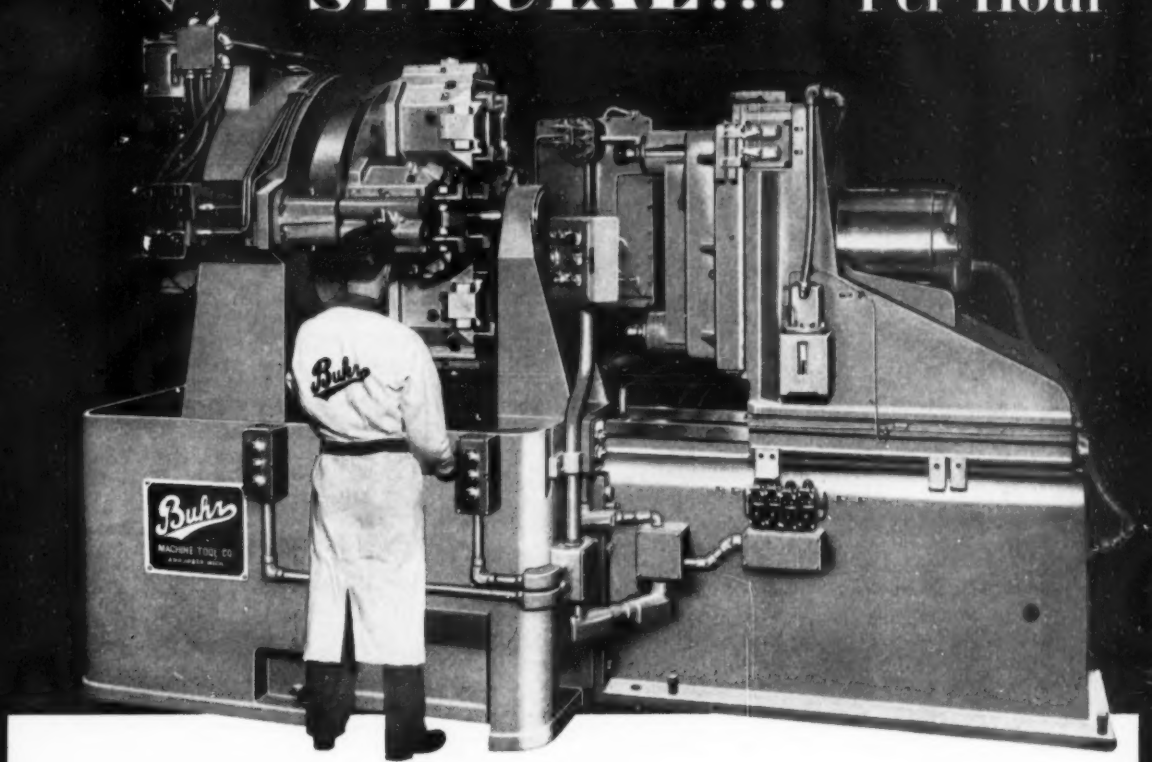
impco

INDUSTRIAL METAL PRODUCTS CORP.
P. O. Box 156 **Lansing 1, Mich.**

Buhr

SPECIAL... Mills and taps 510 Oil Seal Retainers Per Hour



Fixture is arranged with hydraulically operated automatic clamping and automatic index.

Operation: Loading two parts. Station 1 — Load and Clamp.
Station 2 — Tap (2) 5/16-18 Holes and mill two Slots.
Station 3 — Idle.
Station 4 — Tap (2) 5/16-18 Holes and mill two Slots.

As with all Buhr Specials, fixtures are completely interchangeable, hydraulic and electrical installations to J.I.C. Standards, tool steel laminated, hardened and ground ways. Automatic lubrication throughout Machine.

BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

Buhr
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

Swanson TURRET INDEXING UNIT

Save time, money, and manpower in designing and building special, automatic machines for manufacturing operations on small and medium parts.

Swanson

These ready-made, self-contained turret indexing chassis are available in a wide range of turret diameters, speeds, and stations. By providing a "packaged" intermittent motion unit, they eliminate a large part of the time and cost involved in special automatic machine design and construction. They provide a unit ready to go to work on an infinite variety of special jobs, such as staking, punching, soldering, assembling, piercing, etc. Any operational device may be mounted in any position around the turret on standard, adjustable mounting brackets or to the stationary turret center plate. Large operational devices may be mounted on optional floor base plate. Smooth, trouble-free indexing is by uniform acceleration cross-over cam. A positive locking device guarantees accurate positioning at each work station.

Write for Bulletin T1

The Swanson Turret Indexing Unit is one of several precision products developed and built by Swanson to help industry shoulder ever increasing manufacturing costs without impairing quality of product. In a third of a century, Swanson special machines have increased output and improved precision in hundreds of operations.

. . . other
PRECISION PRODUCTS by SWANSON

V-Liner Inspection Unit
V-Liner Concentricity Checking Fixtures
Memory Devices for Automatic Machines
Feeding Hoppers and Positioning Devices
Filling Machines

Engineers and builders of special precision machinery

SWANSON
TOOL & MACHINE PRODUCTS INC., ERIE, PA.

Quality since 1919

ELECTROPUNCH stakes terminals to insulators TWICE AS FAST!

In this strict quality control operation at Cambridge Thermionic Corporation, ELECTROPUNCH — the all-electric impact hammer — has slashed production time *and unit cost* in half! Main reason for the speed-up: ELECTROPUNCH delivers instant, controlled impacts at a faster rate than the equipment previously used, *and* without requiring time to build up pressure! ELECTROPUNCH also *reduced spoilage* resulting from staking these ceramic insulators at inadequate or excessive pressures.

Delivers controlled impacts up to 10,000 lbs. — up to 125 blows per minute! Economical to buy, operate and maintain — adaptable to a wide range of applications. Operable from 110 V., A.C. outlets.

Write, or phone Bigelow 4-6370 for complete information on Black & Webster tools.

BLACK & WEBSTER, INC.
Dept. 3, 445 Watertown St., Newton 58, Mass.
SOLENOID-OPERATED PRODUCTION TOOLS

6 SCHERR COMPARATOR GAGES to choose from . . .

SMALL SHOCKPROOF COMPARATOR 1/1000 or 1/10000"

LARGE MAHR COMPARATOR .00005" graduation ± .002" range

ELECTRIC INDICATOR With OK - Go and No Go

Here are the important characteristics which should be carefully considered when making a selection:

ACCURACY AND SCALE DIVISIONS: .001" - .0001" - .00005" - .00005"

PLUS AND MINUS RANGE OF SCALE The larger the range, the more useful the tool for measuring and assorting.

MEASURING PRESSURE Slight or heavy; is it adjustable to prevent damage of delicate work and fine finish?

ZERO SETTING Is it secure and how easy is re-setting accomplished?

REPEAT READINGS Does the instrument repeat its readings in the hands of skilled and unskilled hands alike?

MECHANISM Is it mechanical or optical and is the action quick and without quiver and vibration?

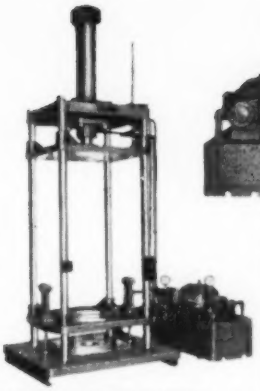
RELIABILITY To what extent are backlash, oil films, errors of screws, etc. eliminated?

Our representatives in all industrial parts of the country are able to give full information and demonstrate any of the tools mentioned in your shop.

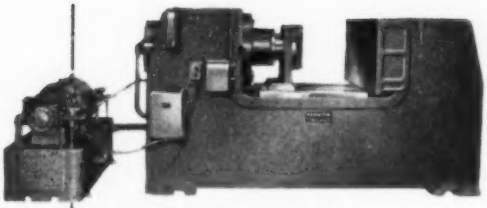
LEITZ OPTI-COMPARITOL Reading .00005" Range ± .0025"

LEITZ ORTHOMETER and ULTRA PROJECTOMETER Strictly Optical. Type A: Scale Read. .00005" Range ± .005" Ultra Type: Scale Read. .000005" Range ± .002"

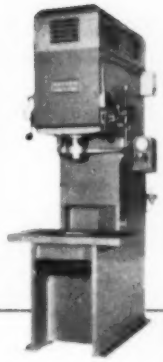
GEO. SCHERR CO., INC.
COMPLETE LINE OF PRECISION INSTRUMENTS
200 AM Lafayette St. • New York 12, N. Y.



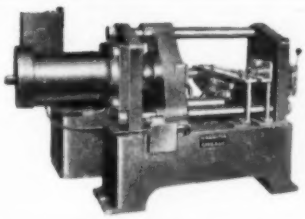
WATER HEATER TANKS are assembled with this 50-ton, 4-column press. Special hydraulic stripper plate raises tank from lower die after assembly.



TRACTOR WELDMENTS for main frames and roller frames are straightened with this 100-ton press. Horizontal design permits use of hoist for easier handling.

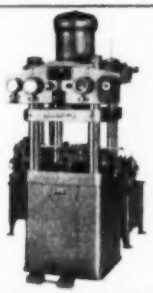


DIE CASTINGS are trimmed on this 25-ton, long stroke, open gap press. Controls reverse on distance; extremely high speed advance and return. Easy on dies. Scrap chute in table.



TRACTOR TRACK LINKS are press-fit assembled in this 50-ton, 3-column press. Assembly includes bushings and connecting pins. Press indexes for various sized links.

HEAVY DUTY straightening and forcing press. 150-ton capacity. Extra reach and large table permit handling heavy work.



HELICAL CUTTER BLADES are formed with this 75-ton, 4-column press. 2-step, timer-controlled operation forms part. Special attachment ejects part and relubricates dies with graphite.

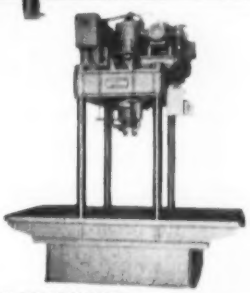
WHEN IT COMES TO PRESSES ...COME TO HANNIFIN

GENERAL PURPOSE 25-ton open gap press. Die cushion under table permits use for drawing operations.

FIBERGLAS PLASTICS are molded with this 50-ton, 4-column platen press. Automatic controls permit high-speed approach, slow closing on dies. Long stroke and extra "daylight" for deep parts.

When your production calls for hydraulic presses, investigate the Hannifin line that includes more than 75 standard models, capacities to 150 tons.

Quite probably you can select the press you need directly from the complete Hannifin catalog . . . or a Hannifin Field Engineer will demonstrate how easily one of these standard models can be modified to meet your requirements. Hannifin Corporation, 1117 South Kilbourn Ave., Chicago 24, Ill.



LARGE WELDMENTS are straightened on this 75-ton, 4-column press. Sensitive pressure control, extra large work table.

Hannifin Representatives Are at Your Service in These Leading Industrial Centers

Atlanta, Buffalo, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Houston, Los Angeles, Milwaukee, Minneapolis, Moline, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, Seattle, Richmond, Va.; Rochester, N.Y.; South Bend, Ind.; Washington, D.C.; Worcester, Mass. In Canada: TEM Sales Company Limited, Toronto and Windsor.

HANNIFIN

Hydraulic Presses • Pneumatic Presses • Hydraulic Riveters
Hydraulic Cylinders • Air Cylinders • Air Control Valves

WRITE FOR BULLETIN 130

Hannifin Corporation
1117 S. Kilbourn Ave., Chicago 24, Illinois
Please send me Bulletin 130 on Hannifin Hydraulic Presses.

Name.....

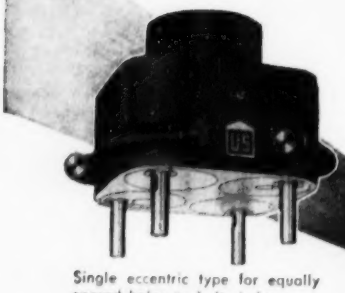
Position.....

Company.....

Address.....

City.....*State*.....

...to protect your investment... save time, money and labor!

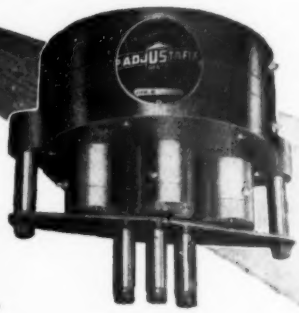


Single eccentric type for equally spaced holes on bolt circles.

US HEADS
SINCE 1915

U. S. drill heads are built for continuous use, with full anti-friction bearing construction, for high capacity thrust leads . . . precision-bored, outboard spindle support plate.

The universal joint adjustable multiple spindle type, an adaptation of a universal joint adjustable spindle, is suitable for any sensitive drilling machine. Joints self-lubricating. Designed for quick change.



New double eccentric AdjUStafix, two to eight spindles, for any adjustment. Eliminates the expensive change in set-up from job to job by simply changing the drill pattern plate and relocating spindles. Fully automatic lubrication for either horizontal or vertical operation.

We manufacture all types of multiple spindle, fixed center, adjustable and lead screw tapping heads.

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in inch ounces . . . inch pounds . . . foot pounds (All Sizes from 0-6000 ft. lbs.)

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P. A. STURTEVANT CO.

Typical application for Atlantic cutting oils, showing a Barber Colman milling machine.

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for high production on tough jobs

Here at last is really effective help in keeping production high in your milling, turning, and drilling departments.

With these new Atlantic non-soluble cutting oils, you can maintain high production rates without the handicap of foul odors on hot tough jobs. Work is visible right through the oil. And the oils are compatible when blended—even down to the heaviest grades. Operators like these new oils better too, because they don't indelibly stain hands or clothing.

Get complete information on these new oils and your copy of the Atlantic Cutting Oil Selection Chart. Learn about this superior measure for cutting oil efficiency . . . determined by performance rather than chemical composition. Write your nearby Atlantic office listed below, or The Atlantic Refining Company, 260 South Broad St., Philadelphia 1, Pa.

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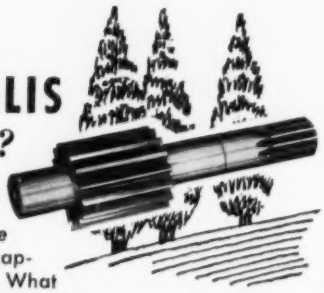
what does
THUJA OCCIDENTALIS
have to do with gears?



Thuja occidentalis is a type of cedar tree —of which there are many in the landscaping around our modern, attractive plant. What do they have to do with making gears? Indirectly, a lot; because they contribute a lot to making our plant a desirable and attractive place for our expert craftsmen to work. Pleasant surroundings, we believe, are of major importance in helping our employees produce the highest quality work they are capable of. Thus our Thuja occidentalis is one of the many details we've considered in our efforts to bring you better custom gears. If you're not already a Cincinnati Gear customer, inquire today for full information.

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Perfex also manufactures Tangi-Matic, the angle-tangent-to-radius dresser that eliminates height gages and "mikes"

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Dept. AM, 124 Avery St. • Mt. Clemens, Mich.

Here this month . . . the most significant publishing event of the year in Metalworking!

The 1954 PRODUCTION PLANBOOK for Metalworking

This month you will have the 1954 PRODUCTION PLANBOOK for Metalworking, the anxiously awaited, annual service to all *American Machinist* subscribers which will be a tremendous aid to you in planning a sound and far-sighted replacement and modernization program in your plant.

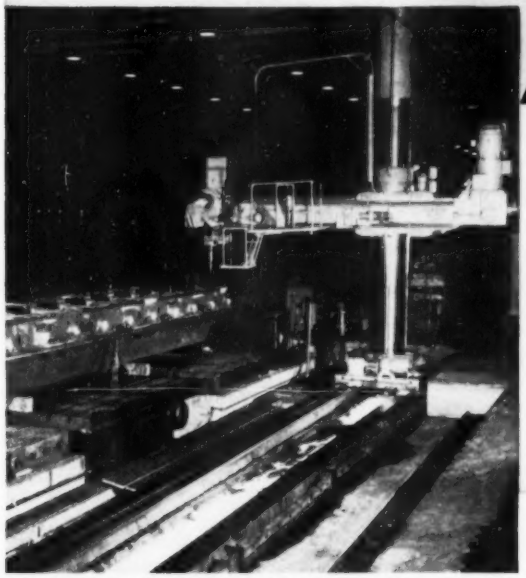
Featured in the 1954 PRODUCTION PLANBOOK is a brand-new Inventory of Metalworking Production Equipment. The Inventory, made possible by the cooperation of metalworking companies throughout the U.S., makes available many important facts regarding this huge industry—facts available nowhere else: how much production machinery and equipment Metalworking now employs (165 major types) . . . how old it is . . . where it is.

Other valuable sections in the PLANBOOK outline case histories of successful modernization programs, and supply you with details of the methods used in determining when machinery in your shop can profitably be replaced.

AMERICAN MACHINIST
The McGraw-Hill Magazine of Metalworking Production

Kaukauna DRILLING and TAPPING Machines

UNIVERSAL AND HORIZONTAL



Special Model 140-U with extended column, runway, and reach—for drilling Diesel Engine bases and blocks.

PROFIT FROM ANGULAR, VERTICAL AND HORIZONTAL OPERATIONS WITH 1 SETUP

Almost any casting or weldment—of almost any size and shape—can be drilled, tapped or spot-faced in any location accurately, quickly and easily with a KAUKAUNA Machine. Furnished with Universal Head with compound swivels, Tilting Head or Horizontal Head, all with 360° column swivel. Horizontal traverse on runway and vertical traverse on column to suit requirements. For portable or fixed location use.

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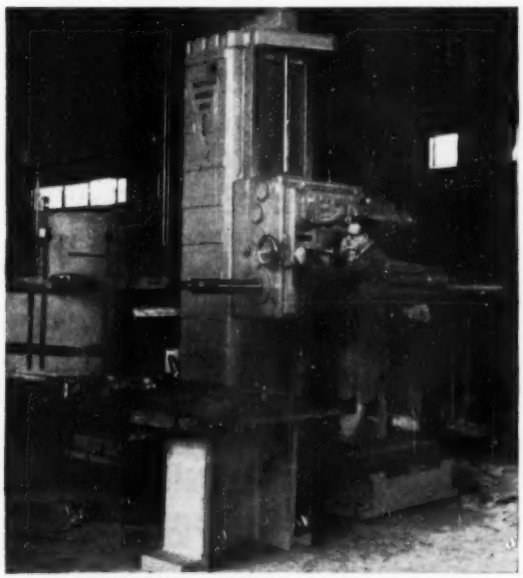
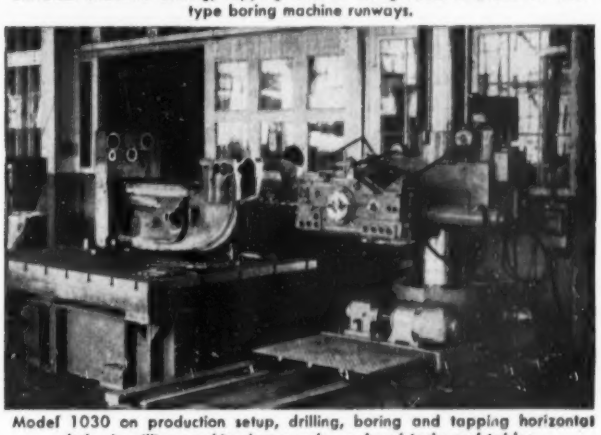


Model 3040 Horizontal Drill—machining all four sides of rail slide casting.



Modef 1030 on production setup, drilling, boring and tapping horizontal holes in milling machine bases, columns, headstocks and tables.

Cut your costs on setup time, crane time, fixturing and machine hours. ***Write for Catalog.***

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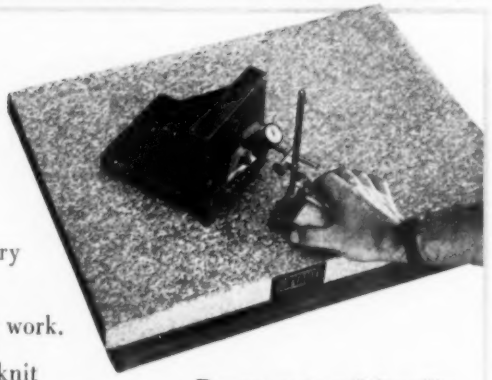
Bryant Granite Surface Plates are economical because of their low initial cost . . . maintenance-free qualities . . . long-lasting accuracy.



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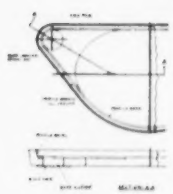
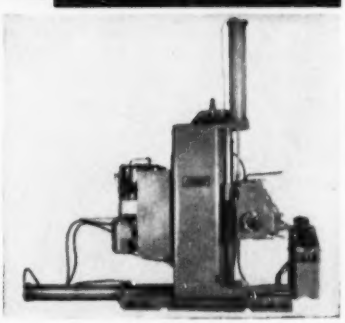


Profile Milling In Armor Plate

—Unretouched Photograph



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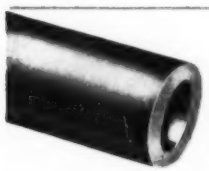
For more information, call the Crucible warehouse nearest you . . . or write for new brochure describing Crucible Hollow Tool Steel. Address Crucible Steel Company of America, Dept. A, Oliver Bldg., Pittsburgh 22, Pa.



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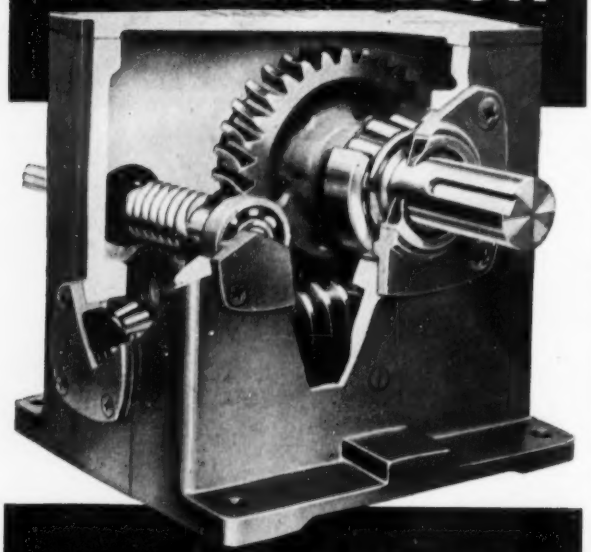
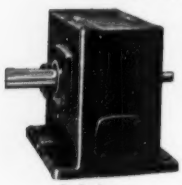
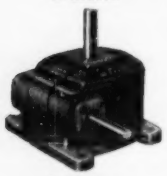


TO YOUR SPECIFICATIONS OR "OFF THE SHELF"

Illustrated above is a cut-away view of Ohio Gear's D drive, showing engineering and sturdiness of the reduction unit.



D Reducer



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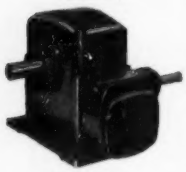

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Ohio Gear engineers are qualified to make expert recommendations . . . write us or see our nearest distributor.

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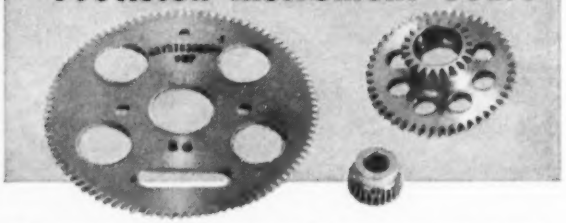
OHIO GEARS

Experimental
Precision Instrument Gears



Much of our work over the past 20 years has been the production of experimental gears in lots of one or more.

We are especially organized and equipped with the necessary machines, inspection instruments and tooling to produce precision, fine pitch instrument gears to A.G.M.A. Classes 1, 2 and 3 (A.G.M.A. No. 236.03 and/or A.S.A. B6.11-1951).

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32 " " " " " " " " " " "
48 " " " " " " " " " " "
64 " " " " " " " " " " "
72 " , 20 degree N.P.A., up to 42 Rc
96 " " " " " " " " " "
120 " " " " " " " " " "

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We'd have to answer, *"Nothing . . . in most cases."*

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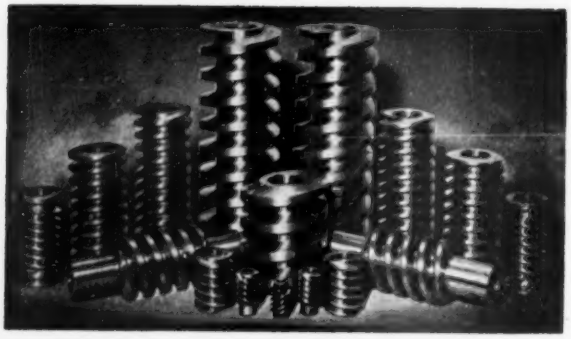

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GEARS

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Overhang

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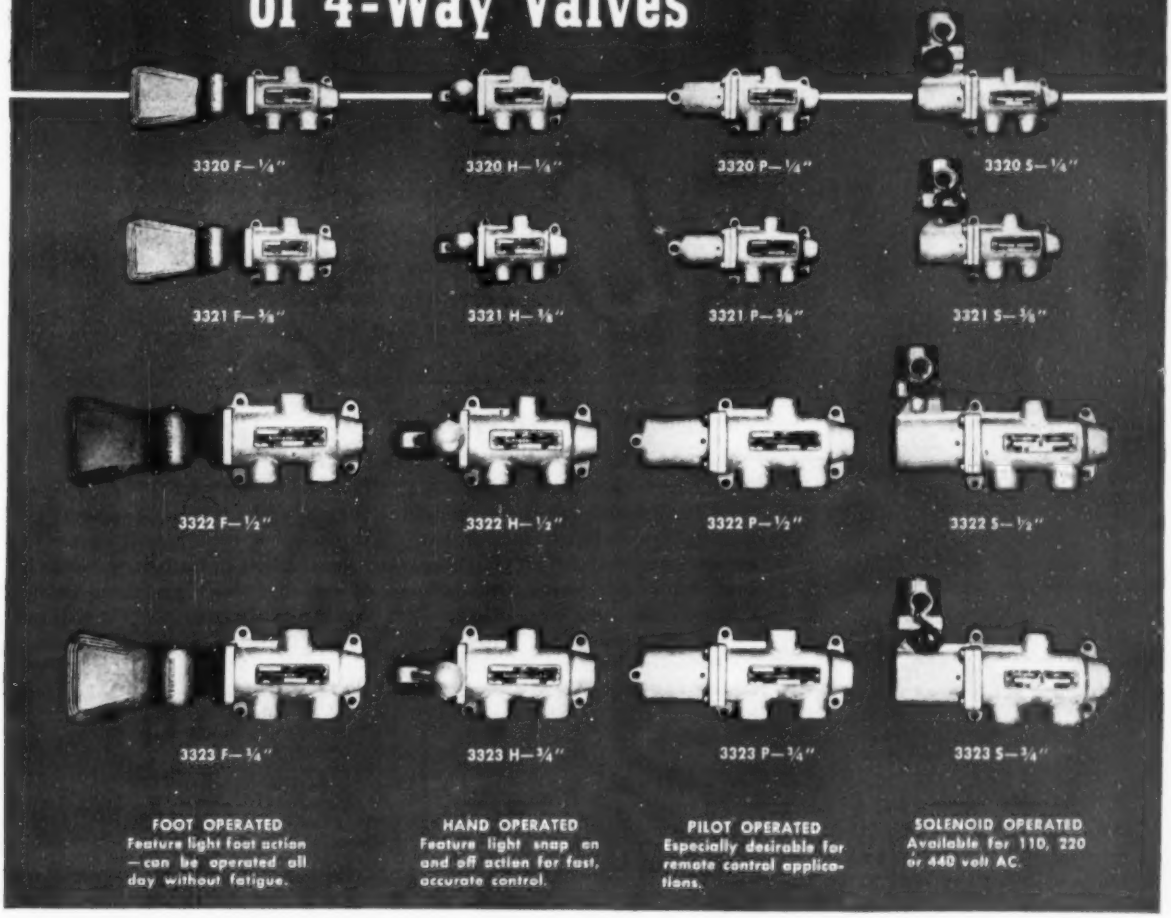
Schrader presents a complete NEW LINE of 4-Way Valves



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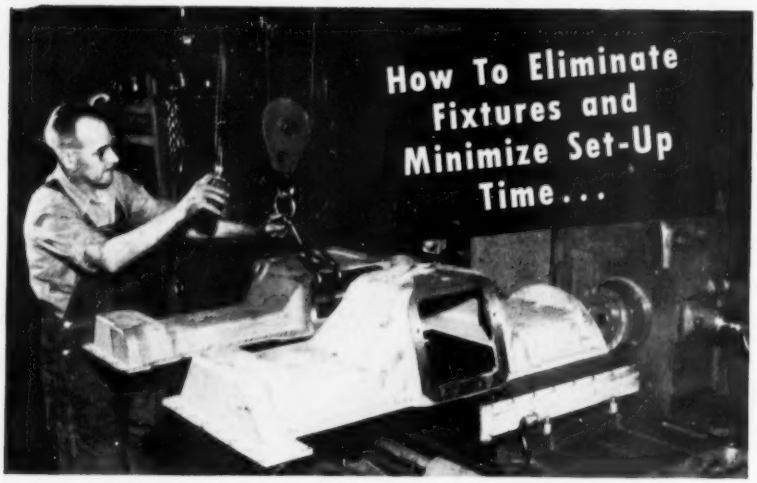

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Here's how Caterpillar Tractor Co. uses Sundstrand magnetic chucks to eliminate fixtures and cut down set-up time. A pair of chucks are used as a permanent set-up for milling the bell end flange on 26 different oil pans. Prior to installation of the Sundstrand chucks, their pans required 7 different fixtures and from ½ to 1½ hours set-up time. With magnetic chucks, a throw of a switch will secure or release either or both pans instantly. If you have milling or grinding operations in your plant it will pay you to investigate Sundstrand magnetic chucks.

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TURNER MACHINE PRESSURE TESTS AND ISOLATES THE LEAK AUTOMATICALLY!

Turner leak-testing machines are adaptable to almost any size or shape production casting!

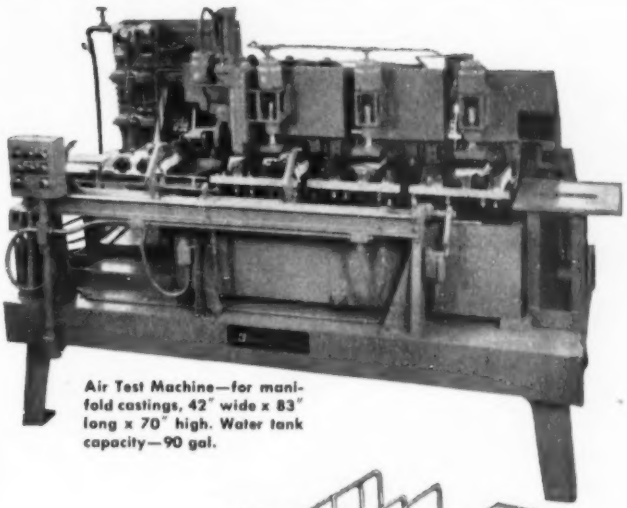
Fixture is specially designed to hold *your* casting, but base and all other parts are standard. That way manufacturing costs are kept at a minimum. You have all the advantages of a machine specially designed for your job, without paying for a special machine design!

Here are two typical applications:

1

Turner Air Test Machine

Designed to leak test manifold castings. Casting is picked up from the automation station, brought into loading position, then transferred automatically to each testing station. When casting is in position in the fixture, the machine clamps it securely in place and seals all openings. By means of air cylinders the casting is then dropped into a 90 gal. water tank and remains submerged for about 15 seconds—allowing the operator ample time to detect and mark any leak. As the checked casting is ejected onto the automation system, the transfer mechanism picks up another casting and the cycle is repeated.

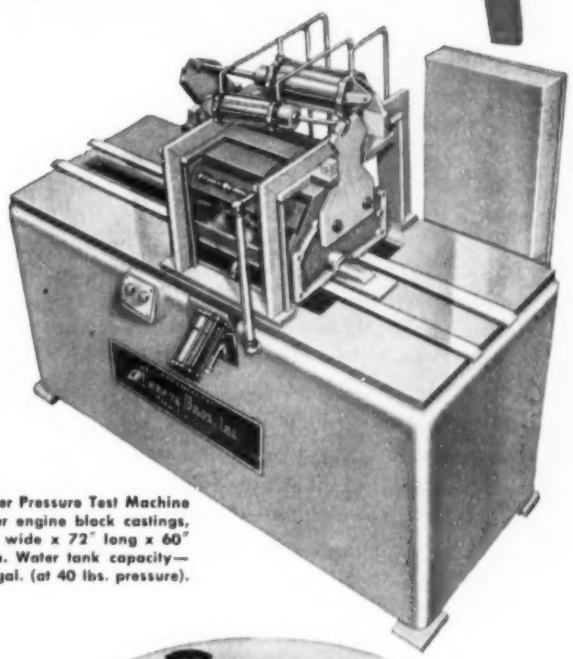


Air Test Machine—for manifold castings, 42" wide x 83" long x 70" high. Water tank capacity—90 gal.

2

Turner Water Pressure Test Machine

Designed to leak test 8-cylinder engine block castings. In this special Turner machine application, engine blocks are manually loaded, but automatically clamped and unclamped in the holding fixture. Water is introduced into the block at 40 lbs. pressure, a force strong enough to allow the operator to visually detect possible leaks anywhere in the casting. For high production, this Turner machine can be equipped with an automatic transfer loading and unloading mechanism.



Water Pressure Test Machine—for engine block castings, 40" wide x 72" long x 60" high. Water tank capacity—50 gal. (at 40 lbs. pressure).

• • •

If you have a production or inspection problem for which you can use to advantage a special purpose machine, write today describing your problem. After our engineering department analyzes it, our field engineer will discuss it with you.

• • •

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DESIGNERS and BUILDERS of:
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Increases production 25%

NEW ROTOR TOOLS "PAID OFF" IN 13 WEEKS

JOB—Large truck cabs had to have heavy welds blended for good appearance. Men objected to heavy 14-pound grinders. Incentive shop . . . needed more production to meet schedule. Grinders required constant maintenance.

SOLUTION—Put Rotor B-12 Verticals at 6000 RPM on trial to determine their metal removing qualities.

RESULTS—Time studies show increase of 25% in production. Savings "paid off" the new tools in 13 weeks, reduced operator fatigue, cut maintenance and sanding disc costs.

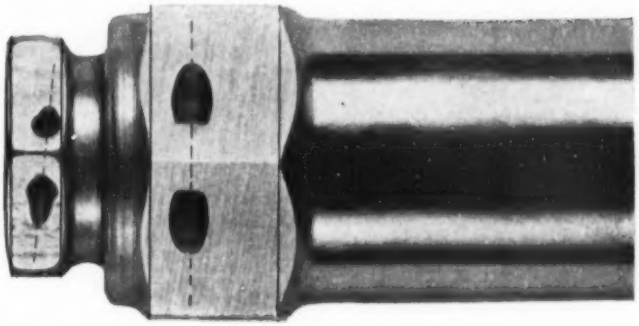
Ask for a demonstration of Rotor tools and figure the savings on *your* operations! Call for a trial. Catalog 40 describing the Rotor line of production boosters is yours for the asking.

ROTOR GRINDER FACTS

B-12 Vertical **5" Cup Wheels**
7" Sanding Pads
10 lbs. **7" Cut-Off Wheels**
4500-5000-6000 R.P.M.

High speed under load—adjustable handles for comfort—built to "take it" on tough jobs.

Is this troublemaker causing headaches in your shop?



(Note that the cross hole drilled on the part to the left—without preliminary spot facing—is on an angle and is not parallel with the face of the part. Further, neither side of the drilled hole is clean. Now compare it to the straight, clean hole on the right, drilled after spot facing.)

Getting the answers to fabricating problems like this is part of doing business with Carpenter!

Isn't it worth a lot to know that the Carpenter Stainless you order is backed by a competent field engineering service to make Stainless fabricating better, easier, more economical? That's the way Carpenter likes to do business! It's one of the surest ways you have to get Stainless fabricating results you've always wanted.

And along with this helpful service, Carpenter brings you the finest Stainless money can buy. Originating in the same mill that invented the first Free-Machining Stainless, it means Stainless that feeds through your machines the same today, tomorrow and a year from now. So for really dependable Stainless backed by helpful shop service, get in touch with Carpenter. THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.

DRILLING CROSS HOLES

Recognize this common troublemaker? It involves drilling cross holes through angular sides of a hexagon head. Some shopmen tell us this job invariably causes them grief from the standpoint of high drill breakage and excessive wear on drill bushings resulting in poorly drilled holes. So one of our stainless service engineers recommended this easy cure: Before drilling, spot face where the drill enters the work. A simple spot facing fixture will do it. In this case the customer's fixture for drilling was O. K. for spot facing and the only tool needed to do this job was a drill ground with a flat end or a regular spot facer. If holes must be exceptionally clean, both sides should be spot faced.

Export Department: The Carpenter Steel Co., Port Washington, N.Y. —"CARSTEELCO"

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takes the problems out of production

Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

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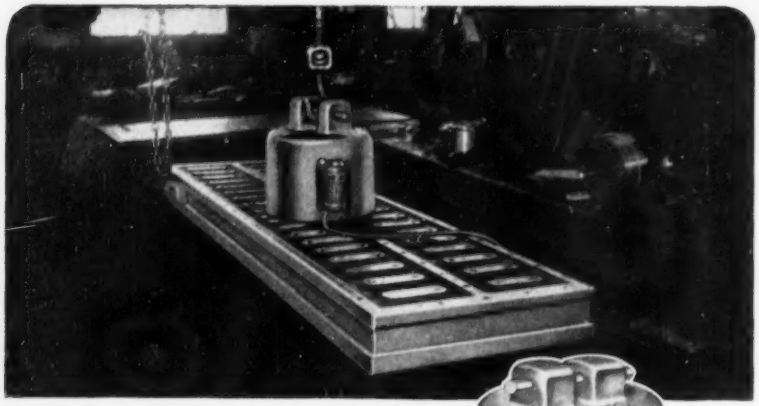

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The Walker material is high in permeability and magnetized to complete saturation with equal flux distribution. . . . The Walker line includes contoured lifting magnets increasing the area of contact for special applications (for wire, pipe, etc.)

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Table movement: 6" x 10"; table size, 7" x 17½".

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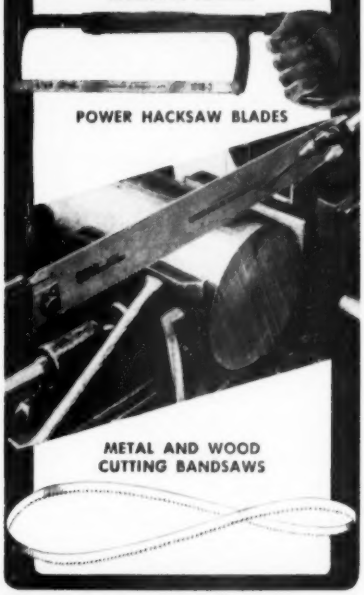

Back of every Star Blade are 75 years of metal cutting *experience*. When you ask for Star, you get a product made of the finest steels available. You get a product made on specially designed equipment which assures *uniformity*, shipment after shipment.

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You'll find that the improved water-cooling system assures cooler and more effective operation even when the torch is used continuously at the full rated capacity. The cooling water flows through the power cable and torch body down to the water jacket and gas cup. The return flow follows the same route in reverse. All exterior "plumbing" has been eliminated allowing more maneuverability and preventing leakage due to accidental damage. Water-cooling makes lightweight torch construction possible, and because the power cable is also water-cooled, it too, is lightweight and easy to handle.

The HW-10 was designed so that the water passages are accessible and easily cleaned.

Electrodes are easily adjusted on the HW-10. A quarter turn of the torch cap releases the electrode for adjustment or replacement. You need no wrenches or other tools. In addition, electrode stub loss is reduced by placing the water-cooled electrode holder much closer to the arc.

Are you getting the best possible results from your present welding apparatus? Developments in the inert gas welding field have been so great and have come so rapidly that torches over four or five years old are now obsolete. Be sure that you have the highest production at the lowest cost. Modernize with the 300 amp. HELIARC welding torch.

Your local LINDE representative would be happy to give you more detailed information on the HELIARC HW-10.

"Heliarc," "Hastelloy," "Linde," and "Multimet" are registered trade-marks of Union Carbide and Carbon Corporation.

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Long. table speed, infinitely variable FPM	55'
Grinding wheel	8"x¾"

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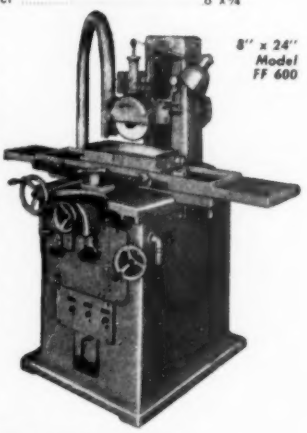

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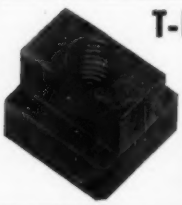

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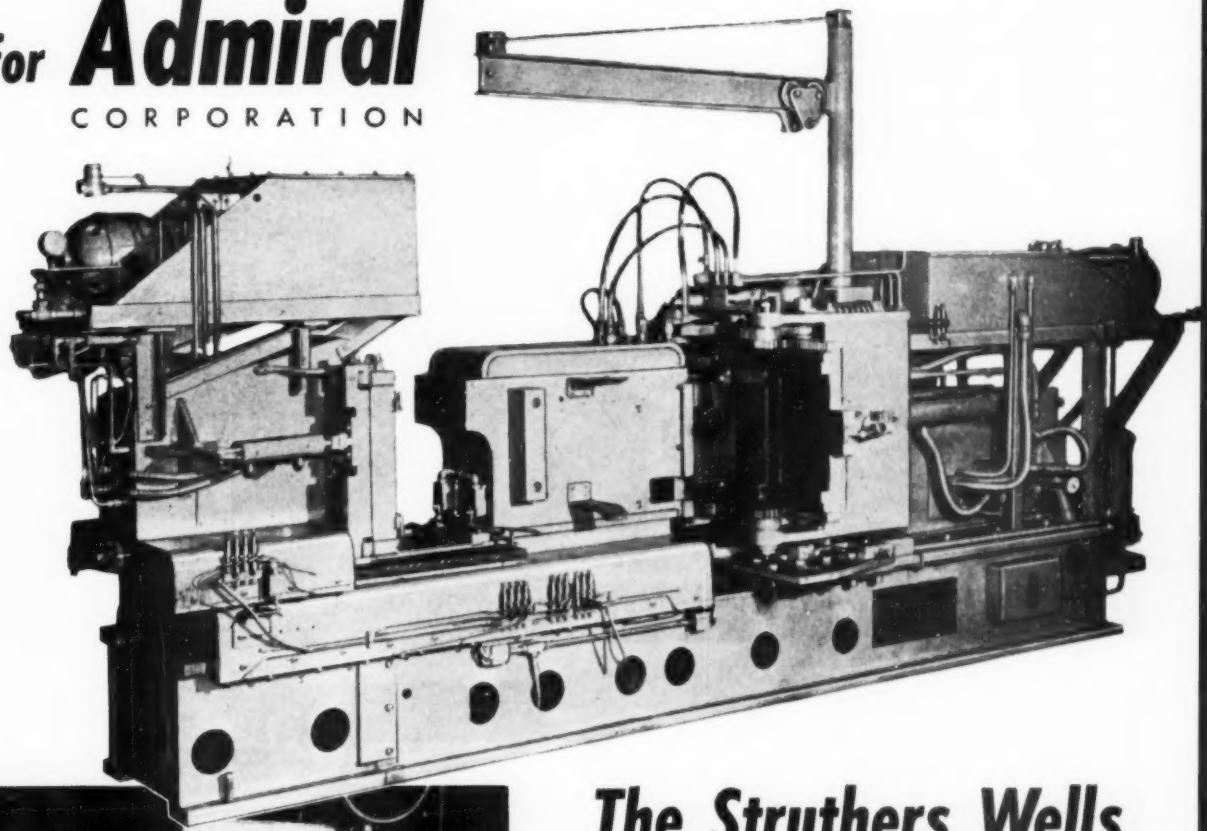

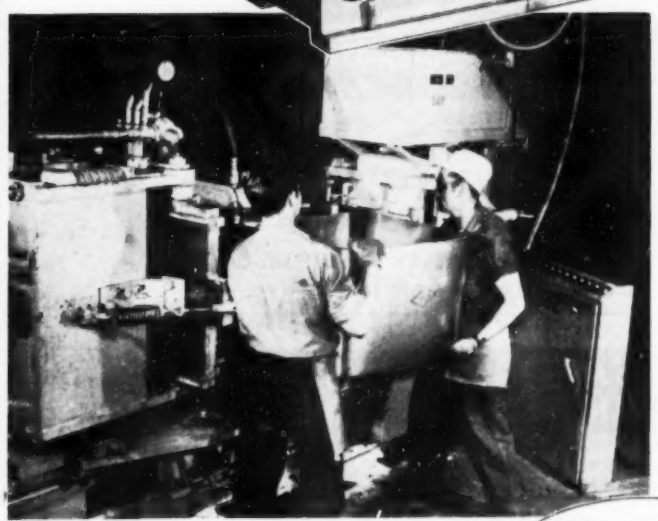

The Struthers Wells Tangent Bender at work in the Admiral plant. Auxiliary bender forms bottom in-bent flanges while cabinet is held in main dies—assuring proper side height, saving handling and re-location to other machine.

The Struthers Wells TANGENT BENDER

DOUBLE WING MODEL

Admiral Corporation's appliance production is speeded and costs are lowered by the efficient Struthers Wells Tangent Bender—which forms outer cabinets smoothly and rapidly in a single operation. This powerful machine is in wide use by the household appliance industry for one-piece cabinet forming, radially edge-bending flanges on preformed material, crowning refrigerator tops, doing the whole job! *Write for fully detailed Tangent Bender Catalog.*

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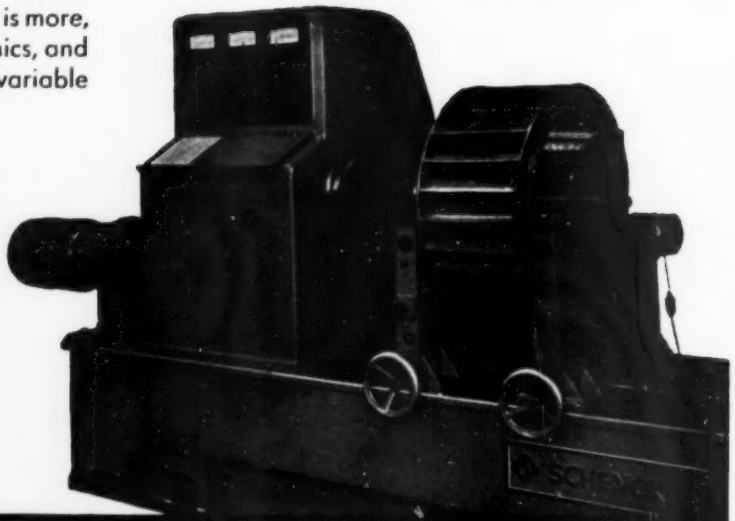

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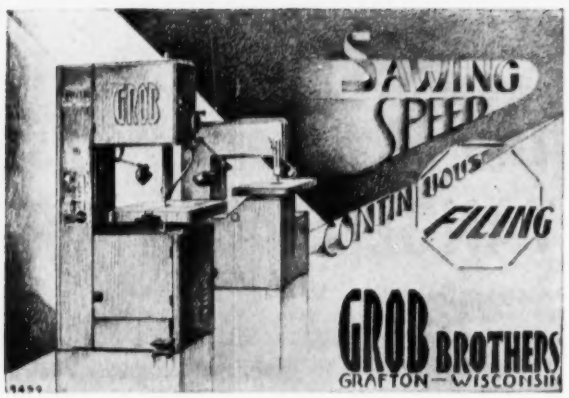

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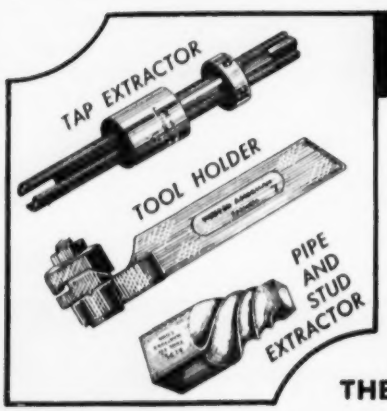

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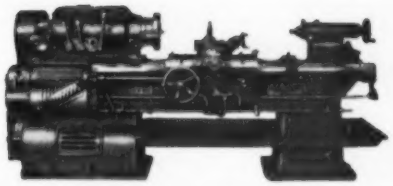
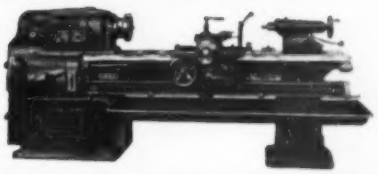
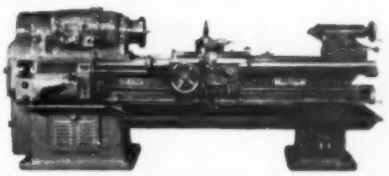


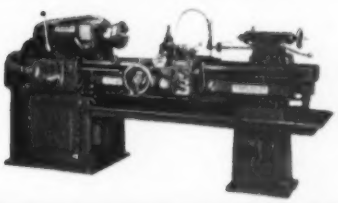
18" — 20" — 24" 12-speed Geared Head Lathes



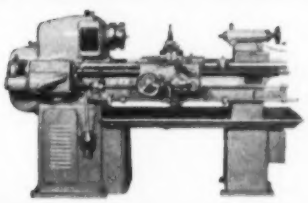
12" — 14" — 16" 18-speed Geared Head Lathes



12" — 14" — 16" 12-speed Geared Head Lathes



No. 2 General Purpose Lathe



No. 1 General Purpose Lathe

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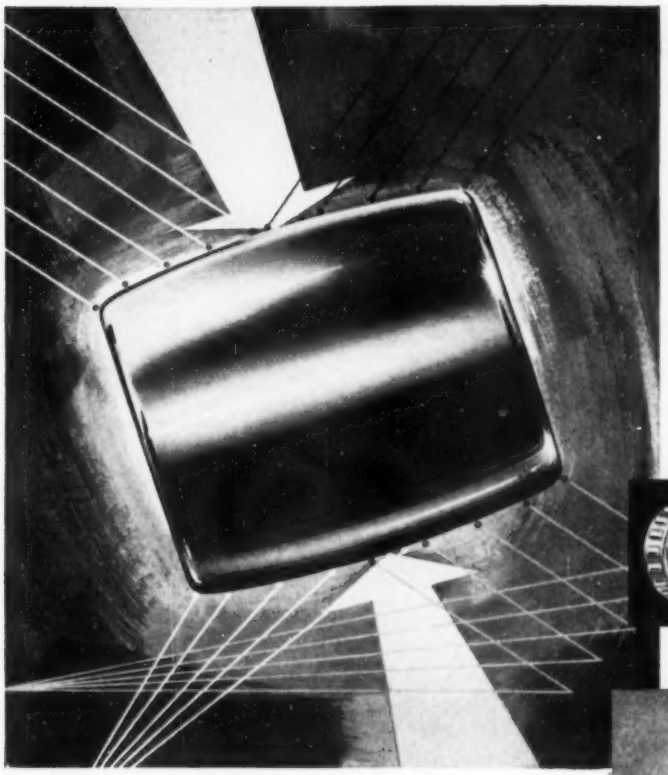

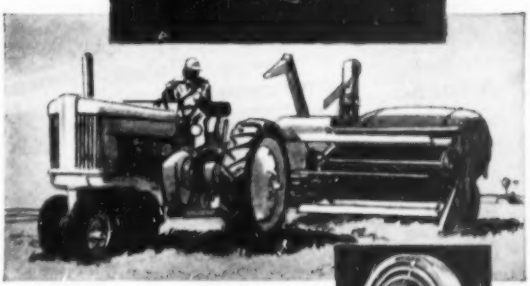

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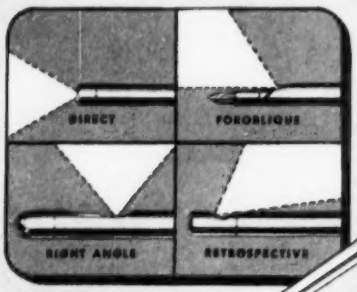

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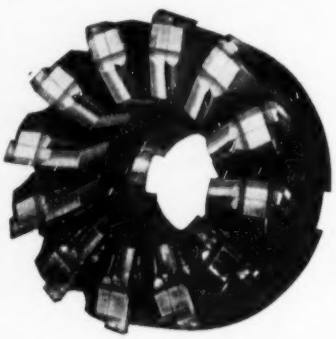

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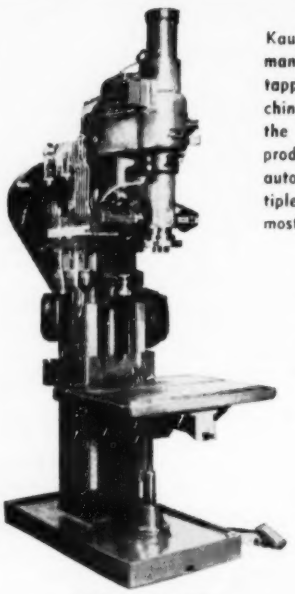
BUILT FOR SPECIFIC PRODUCTION JOBS



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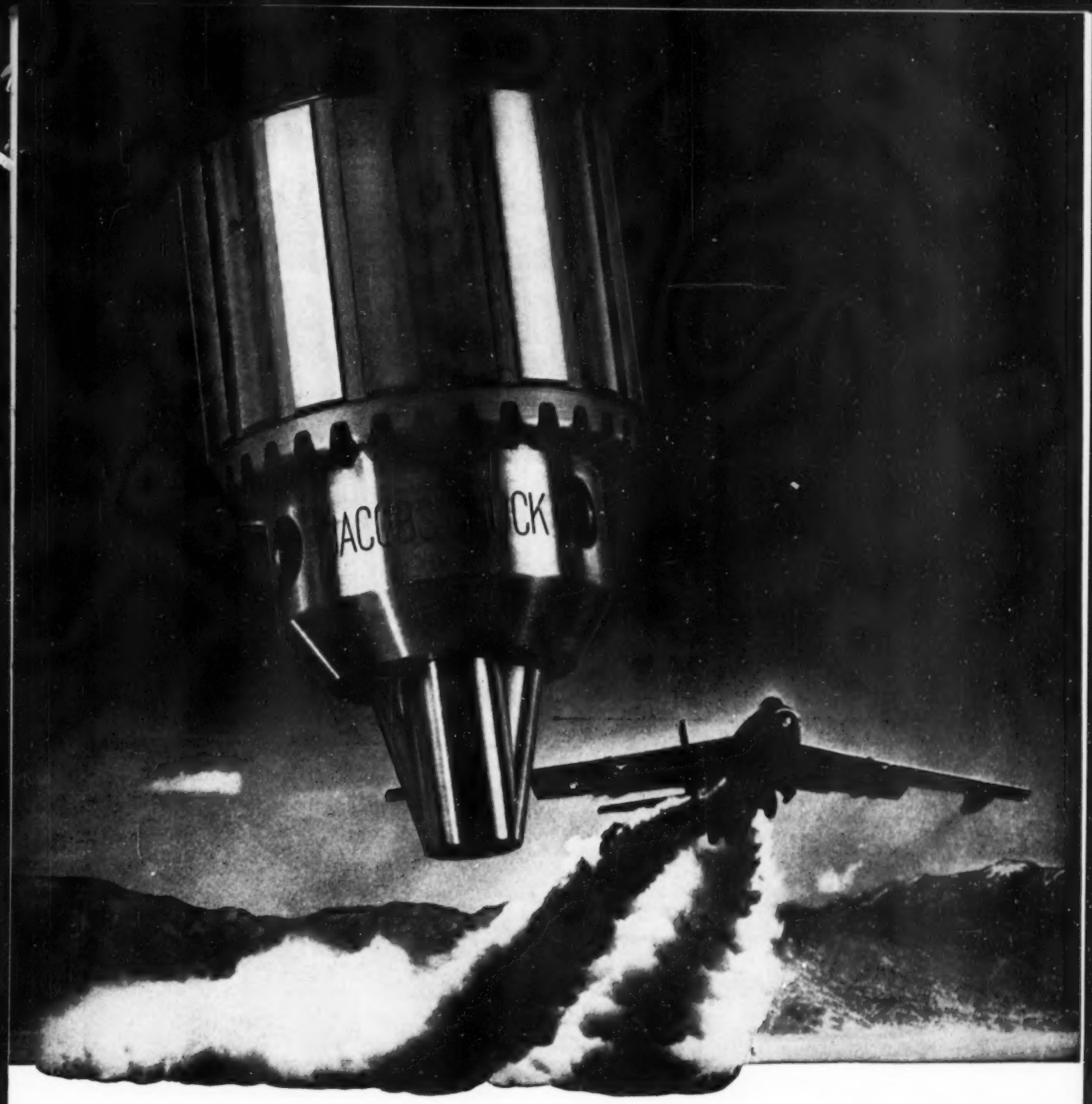

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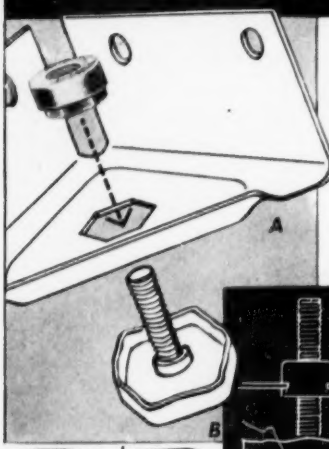
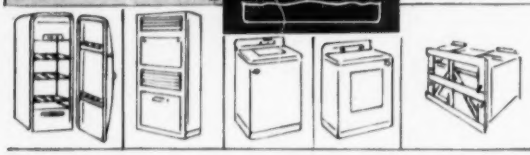
GRIPCO "CLINCH" NUTS IN "BLIND" ASSEMBLIES



for "fixed" fastening
This is the way leading manufacturers get fasteners into inaccessible places.

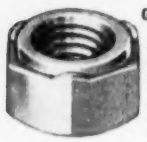
A—Inner View. GRIPCO "Clinch" Nut ready to insert into hexagonal hole in metal. Shows "pilot" and hex hole before clinching.

B—Cross-Section view after pilot has been clinched and bolt inserted. Can be locked at any point. (Non-locking nut can be supplied if preferred).



● Makers of washers . . . dryers . . . refrigerators . . . ranges . . . freezers . . . room air conditioners and many other appliances are enthusiastic over these new and better fasteners—Gripco "Clinch" Nuts. In many cases they do a double job—*first*, to hold the product rigid and safe in its container during shipment, with no risk of bolts "backing out"—and *second*, for holding the adjustable "levelers" after the appliance is delivered to the user. If you have any application with hard-to-get-at fastening or that needs additional threading depth for applying bolts to thin metals, investigate Gripco "Clinch" Nuts.

Where Welding is Available — You may prefer to use



GRIPCO Pilot Projection Weld Nuts
Circular pilot accurately positions nut in the bolt hole, for resistance welding. No jigs necessary. Two pilot heights for different gages of metal.

or GRIPCO Countersink Weld Nuts
The special countersink feature eliminates the possibility of hot metal particles lodging in the threads; thus no retapping is necessary.

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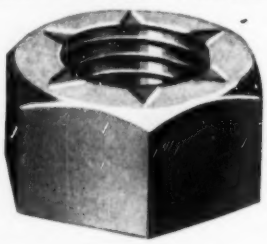

Write for samples, mentioning types and sizes of nuts you use. 480

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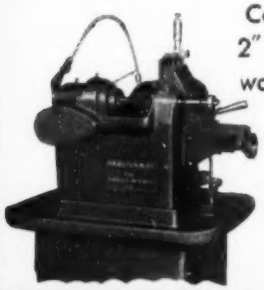
HAMILTON No. 00

For the generation of spur gears and pinions only.

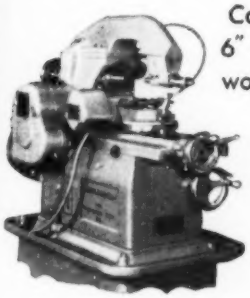
Capacity: 2" O.D. of workpiece.



HAMILTON No. 1

Hobs spur and spiral gears, worm gears and worms (to three thread), splined shafts, gear sectors, and pinions.

Capacity: 6" O.D. of workpiece.



HAMILTON No. 1-B

Generates any shape that can be made on the No. 00 or the No. 1 machines, *plus* bevel gears and face gears.

Capacity: 6" O.D. of workpiece (3" O.D. by 3/16" face, for bevel gears.)

Exclusive Greater range of hob spindle speeds: 109 to 1259 R.P.M. — 12 speeds.

Exclusive Speed, feed, indexing. *Each can be selected independently.* This, and wide range of hob speeds, adds flexibility; reduces set-up time; gives quick selection of speed and feed to suit material and gear size.

Exclusive Alignment and trueness of work and hob spindles are held to within .0002".

Exclusive Generates gears from 3 teeth to 1200 teeth.

Exclusive Accumulative error of not more than .0002"

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Almost every metalworking plant has one or more operations where an adequate supply of clean, dry oil is a virtual necessity. 18 such applications are suggested in the panel and in every case a De Laval Oil Purifier provides the quickest, low-cost method of keeping these oils ***clean*** and ***dry.***

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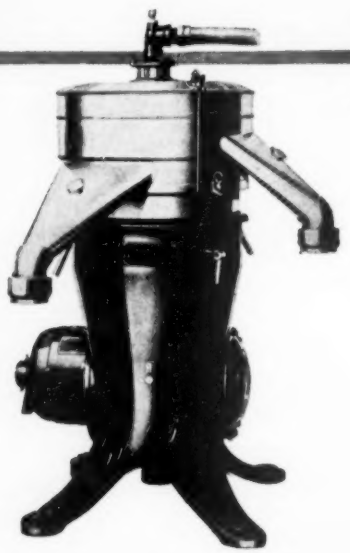

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Steelweld Shears operate on the widely acclaimed pivoted-blade principle. Shear action is controlled by electric foot switch. Machines for making cuts up to 24'-0" are now in service.

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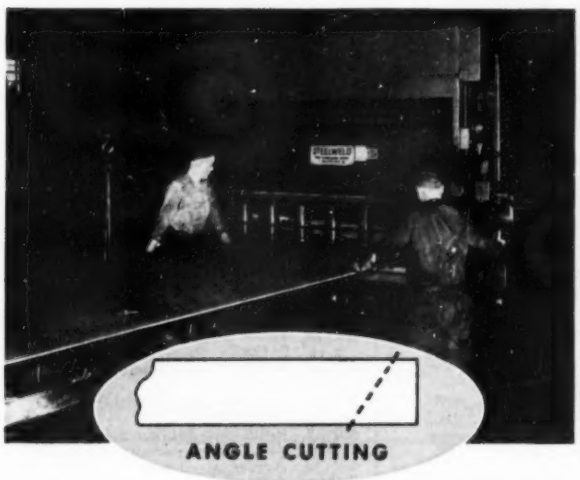
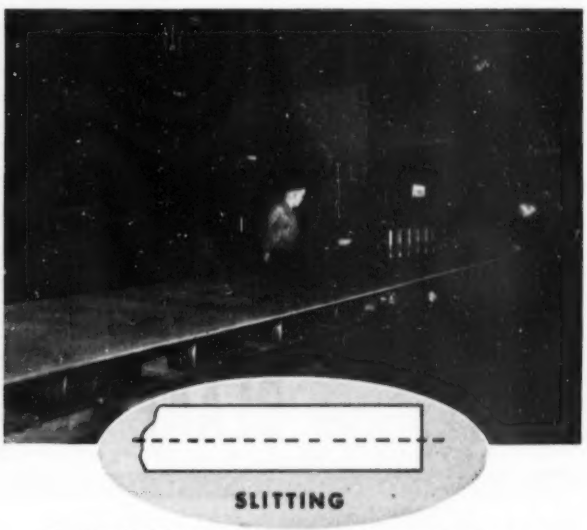


Because of the deep throat in end housings, larger size sheets or plate can be cut at various angles than possible with most shears. This is also a great advantage when notching and slitting.



The standard 24" throat depth permits slitting sheets up to 48" wide on any line. 36" throats are also available for larger machines.

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- Gives much more production per tap!
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Model 66", two compartments

MACHINES

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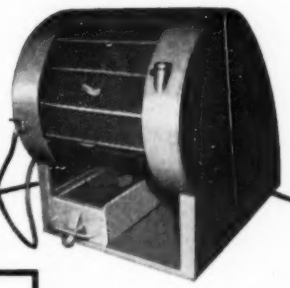

Model 36", two compartments

Model 24", two compartments

Designed For Small Lot Production and Laboratory Processing.

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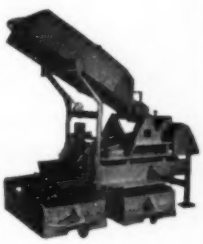
Two deck parts-and-chips separator and chip grader



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This advancement has, in many production shops, actually eliminated the "welding bay," and made welding an all-important station in the production line.

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WARREN, OHIO

How to Control SHOP COSTS

Skillful control of all operations involved in developing, manufacturing, and marketing the products of your company bears strongly on your company's profit situation.

This *American Machinist* Special Report describes methods of controlling manufacturing costs that can be applied in jobbing as well as production shops. Basic concepts of common costing methods are examined, and emphasis is given the fundamentals upon which all systems must be based to produce accurate operating figures.

Numerous graphs, charts, and reproductions of the many operating reports required add to the helpfulness of this fifteen-page report by Albert E. Grover, Cost Consultant.

25 cents a copy

Reader Service Department

American Machinist

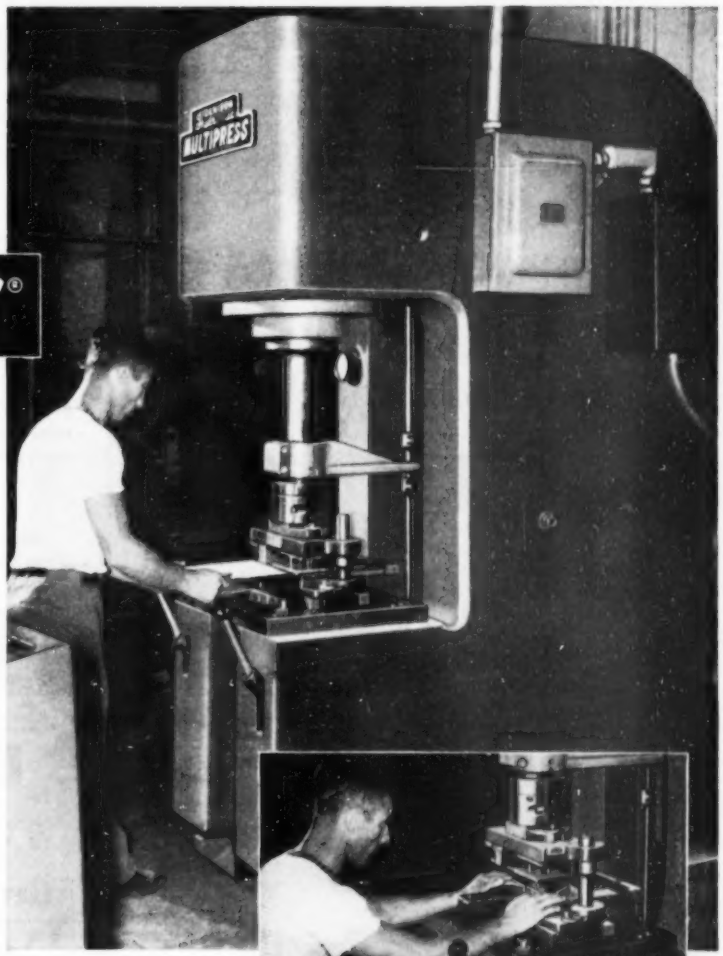
McGraw-Hill Building

New York 36, N.Y.

"Paid for itself on 50,000 Parts"

says A. J. Houseman, vice president of Automatic Radio of Boston, in discussing his firm's use of

MULTIPRESS®



ABOVE: *Clear, easy access to tooling, full visibility, easy parts-loading from comfortable sitting position, and dual safety controls make Multipress popular for easy operation as well as for cost-cutting efficiency.*
BELOW: *Two views of a part that is first deep-drawn, then blanked and pierced, on a 50-ton Multipress that paid for itself in reduced costs on only 50,000 parts.*

Here again, Multipress *paid off fast*—for this manufacturer of radio sets for leading makes of cars.

A 50-ton Multipress blanks, pierces, and draws *cold rolled steel* to form auto radio cabinets and front escutcheon plates that are stronger and better finished than the die-cast parts they replace.

In addition, costs are so much lower that Multipress literally paid for itself on one run of 50,000 parts.

This remarkable saving is made on two operations handled on a 50-ton Multipress. In a single stroke, flat predeveloped blanks of .032 *cold rolled steel* are deep-drawn under 18-ton pressure to the intricate shape shown in Fig. 1 — a job that ordinarily required 2 or 3 separate operations. Later, the same Multipress blanks and pierces the parts as shown from the back, in Fig. 2.

Easy, stepless adjustment of the Multipress ram effort permits pressures to be set just above the point at which dies "break through" the metal. Added to the smooth, *controlled* hydraulic ram action, this cuts "die punishment" to the bone. When dies become dull and fail to break through, they're quickly resharpened with minimum grind-off—hence, *dies last four to five times longer than in the previous method.*

Production speeds now reach 400 per hour on blanking, 1500 per hour on the drawing and forming. On a smaller radio head of .040 chrome plated cold rolled steel, output is up to 2100 parts per hour. Scrap loss is also drastically reduced.

Automatic Radio is now adapting several other jobs to Multipress, with the idea of matching the gains made on these typical examples.

DENISON HydrOILics

Because both the action and pressure of its ram are so widely adjustable and are fully controlled at every stage of operation, Multipress readily meets an amazing variety of needs for fast, safe, low-cost production. Multipress is available in 9 frame sizes—bench and floor types—in capacities from one to 75 tons, with manual or automatic controls for almost any requirement. Standard Multipress feeds and accessories offer extra speed and efficiency on many types of operations. Write for full details.

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you get maximum "use-value" when you standardize on

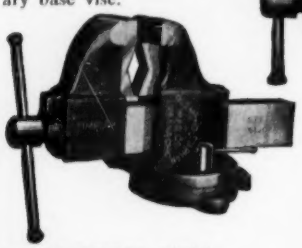
Desmond-Simplex

STEEL SLIDE VISES

You name the job—there's a Desmond-Simplex Steel Slide vise for every holding operation in your shop. Choose *all* your vises from the complete Desmond-Simplex line at your Industrial Distributors . . .

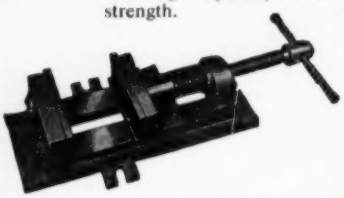
MACHINISTS—stationary base, extra rigid, firmly mounted vise for heavy pounding and bending operations. STEEL SLIDE, as on all Desmond-Simplex vises.

MACHINISTS — Swivel base for convenience, all the strength of a stationary base vise.



COMBINATION BENCH AND PIPE—High grade pipe jaws and deep vise jaw depth plus Steel Slide give unusual holding capacity and strength.

DRILL PRESS, MILLING MACHINE—Precision made for heavy or medium duty. Slots in base for machine alignment, variety of jaw faces available, non-pinching type handle.



Ask your Industrial Distributor for Desmond-Simplex Catalog No. 60 or write THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO, Dept. M-F. Contains complete description—application photos.

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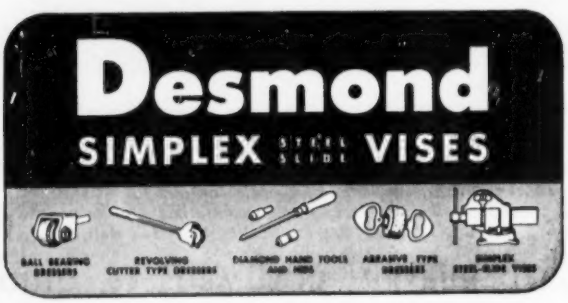

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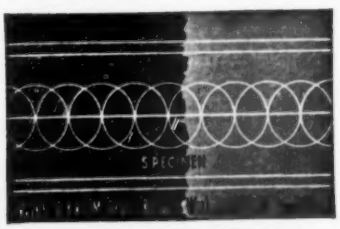

Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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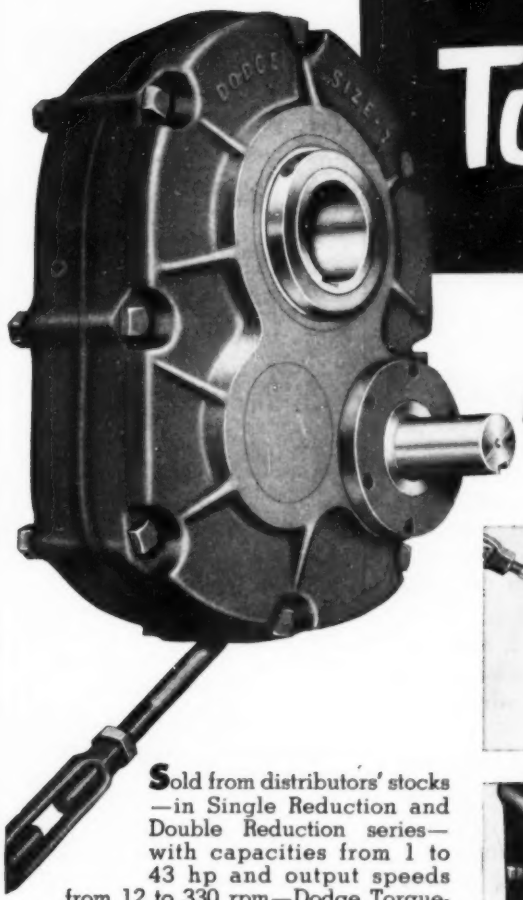

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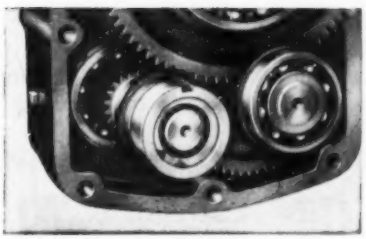

TORQUE-ARM BACK STOP
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Sold from distributors' stocks—in Single Reduction and Double Reduction series—with capacities from 1 to 43 hp and output speeds from 12 to 330 rpm—Dodge Torque-Arm is the new and modern idea in speed reducers.

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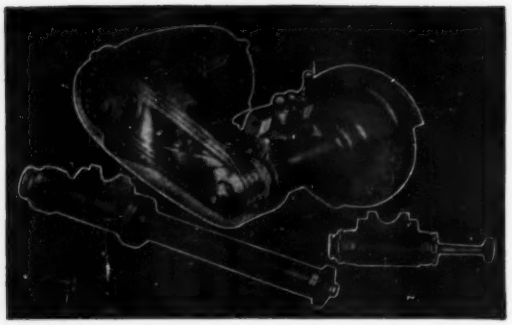

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is a precision Grinder!

Either internal or external—your boring mill, too—and planer and other machine tools in your shop, are now capable of precision grinding of rolls, surface plates, bearings, journals, mandrels, cutters, etc. They merely require a HISEY Wide Range Precision Grinder attached to their regular tool holding fixture.

Built in a number of sizes and types, they are adaptable for production work as well as the thousand and one odd grinding jobs which crop up in every shop and tool room.

The V-Belt drive affords the most efficient and economical speed and permits rapid speed changes as required.

Driven by constant speed motor, a steady, uniform speed is maintained as required for best results.

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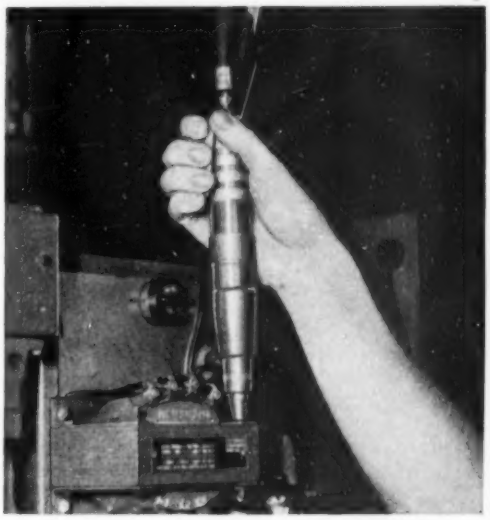
From the *American Machinist* Library of *Tips for Top Shop Men*

AN invisible boss presides over every collective bargaining session. He is not labor, management, or government—but is the customer, who exercises power of selection over your company's products.

Quick cure

for a production line headache



—A NEW AIR SCREWDRIVER THAT'S REALLY QUIET

Replace your present screwdrivers with Chicago Pneumatic's new CP-3008 — the really quiet, air screwdriver. Its supersonic exhaust feature changes sound waves to a frequency which approaches the limit of human hearing.

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The exceptional tensile and torsional strength of Mac-it Screws makes it possible to use smaller, lower cost screws for all fastening jobs. Mac-it Special Alloy Steel used in all Mac-it Screws is held to rigid specifications, assuring uniform and dependable screw fasteners.

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ONE MAC-IT CALL GETS 'EM ALL!

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Each type Mac-it Screw is heat-treated to possess maximum strength for the particular purpose for which it is to be used. No one heat-treatment is best for all purposes.

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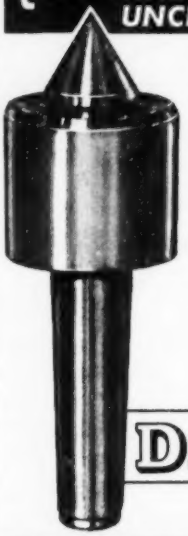

Get every dollar's worth of production from QUADRO PRECISION LIVE CENTERS—designed to support the HEAVIEST load at HIGHEST speed for the LONGEST time! Guaranteed accurate to .00005"—they will outlast dead centers by far!

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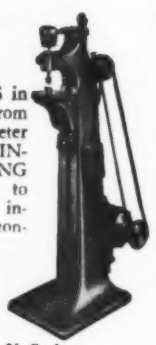

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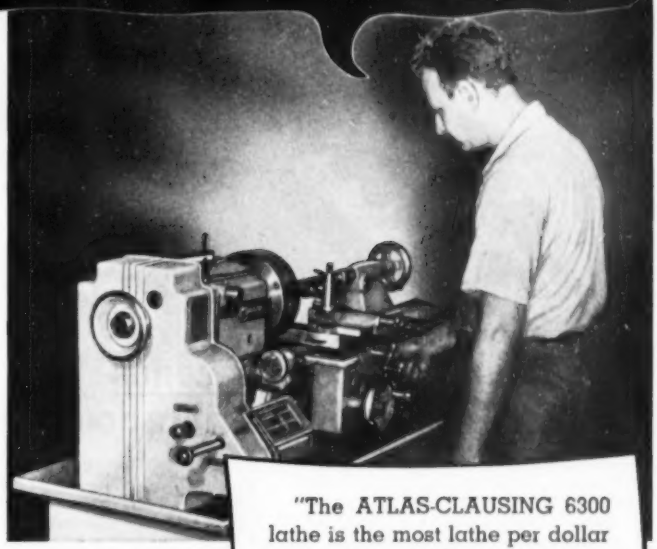
"most lathe per dollar invested"

— Laurence Carl



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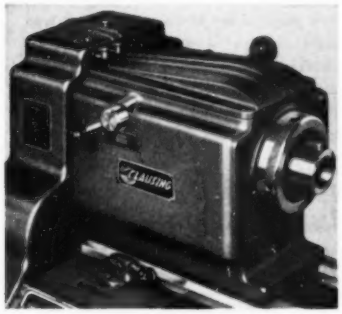
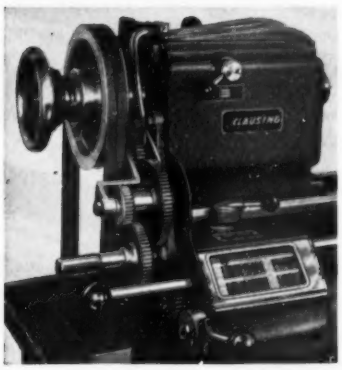
On any basis of comparison, ATLAS-CLAUSING 6300 Series are standout values for efficient 24-hour production . . . tool room or research work. 8 speeds, 50 to 1300 RPM — 12¼" swing over bed, 7½" over saddle. 24" — 36" — 48" between centers — headstock, apron, and quick change gears run in baths of oil. Get all the facts from your ATLAS-CLAUSING Distributor.

"The ATLAS-CLAUSING 6300 lathe is the most lathe per dollar invested available within its size range. Because of its in-built accuracy we are able to move spindle and nose fixtures from one lathe to another without affecting the accuracy of the product. The upkeep is unusually low and operators can deliver large production because of good control. It's a fine profit making machine."

Signed — Laurence Carl
Carl Manufacturing Company



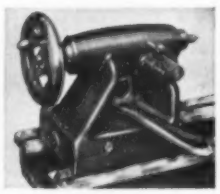
The heavy, thick-walled grey-iron headstock is fully enclosed and all moving parts run in a pumped bath of oil. Spindle is forged, precision-ground steel with 1⅛" bore and 1" collet capacity . . . turns on heavy duty Timken precision tapered roller bearings. Hardened and ground spindle nose L-00 is tapered key-locked type. Spindle can be reversed without danger of the chucks coming off.



Drive is underneath, with spindle pulley mounted "outboard" — replacing belts is a quick, easy job. Dual A-belt drive assures full transmission of power.

Quick-change mechanism is enclosed . . . gears and shafts run in bath of oil. Provides instant selection of 48 threads or feeds. Feeds from .00065" to .036" per revolution of spindle, and right and left hand threads from 4 to 224.

Massive, semi-steel bed is 7⅜" wide, 5¼" deep — thickly ribbed and braced. Vee-ways, flat ways and undersides are ground — all eight surfaces align to within .001".



Heavy, quick positioning tailstock. Permanently attached swing type wrench controls bed lock. Graduated ram is bored for No. 2 Morse taper.

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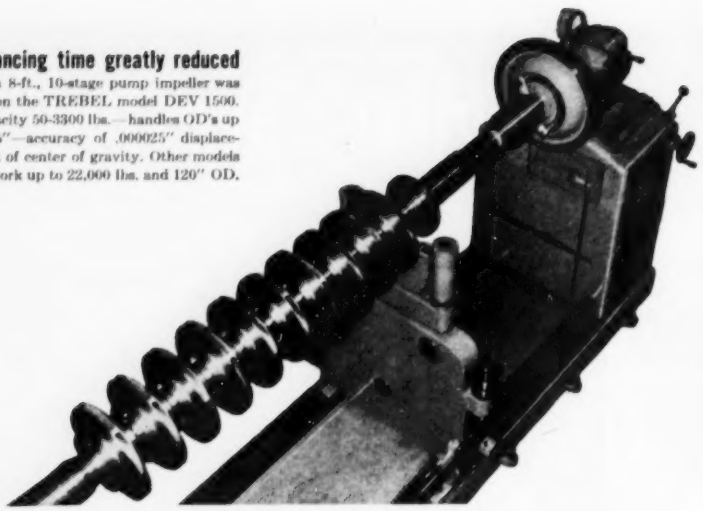
Balancing time greatly reduced when 8-ft., 10-stage pump impeller was put on the TREBEL model DEV 1500. Capacity 50-3300 lbs.—handles OD's up to 65"—accuracy of .000025" displacement of center of gravity. Other models for work up to 22,000 lbs. and 120" OD.



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detects unbalance in seconds with TREBEL counter-vibration principle

That's all it takes—less than a minute—to locate amount and angle of unbalance in this 10-stage pump impeller, because—

TREBEL BALANCERS use a unique principle in which mechanical counter-vibrations counteract unbalance.

No previous calibration is necessary—operator takes direct readings in the TREBEL BALANCER during the first run—amount of unbalance in ounce-inches; location in degrees.

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No special skills are required.

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This is typical of TREBEL performance in hundreds of important plants here and abroad—the kind of performance *you* can expect, too.

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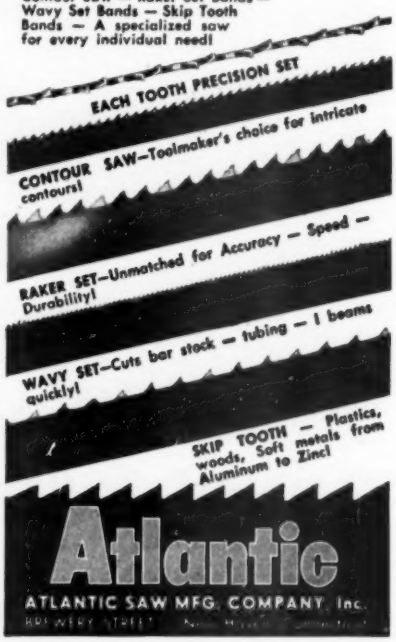
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Atlantic

ATLANTIC SAW MFG. COMPANY, Inc.

From the *American Machinist* Library of *Tips for Top Shop Men*

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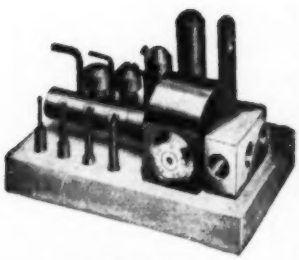
PLAN for TOMORROW . . . by making the Bridgeport TURRET MILLING MACHINE a "MUST" for TODAY

Many shops have modernized their production methods by replacing obsolete equipment with BRIDGEPORT MILLERS . . . the machines that mill, drill, bore and shape at all angles with one set up.

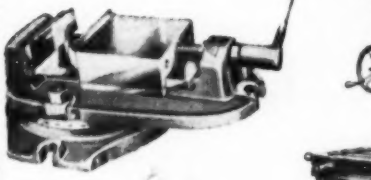
These shops *planned* for the future when they installed "BRIDGEPORTS" in their tool rooms, die shops and production lines. They were convinced by the experience of others that their moderate investment in modernization would be returned quickly through economies they could effect, and that obsolescence would be deferred for many years to come.

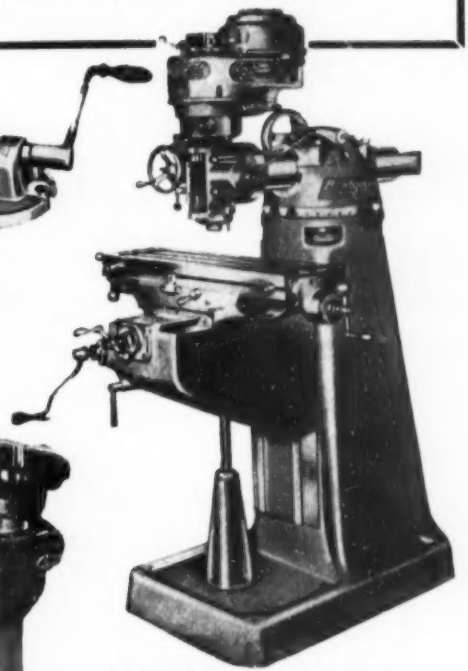
A most plausible reason for the long time economy of the "BRIDGEPORT" is not merely its faster, more convenient and closer accuracy in handling a wide range of work but because improved methods over those offered by Bridgeport Turret Milling Machines have yet to be developed for practical application.



MILLING MACHINE VISE

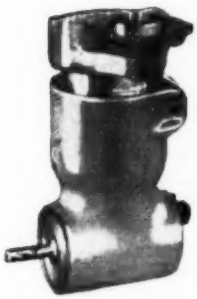
This improved vise provides great gripping power, is streamlined for appearance and equipped with coolant trough. Rigid holding is assured by large diameter screw. Two sizes; 5"x3½" and 6"x5" jaw openings.





NO. 2 BORING HEAD

Boring Tools and Holder provide the means of boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



RIGHT ANGLE ATTACHMENTS

(Left) *Heavy Duty* . . . For milling and drilling at right angles. Fits both Master and 1 HP Bridgeport Heads.

(Right) *Light Duty* . . . for right angle milling and drilling narrow, deep molds and cavities.

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Bridgeport, Connecticut

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A machine that emphasizes the combination of Precision, Production, and Economy . . . It embodies many features that provide for faster, more economical milling, resulting in a substantial cut in production costs . . . It is sufficiently rugged for day-to-day operation and can also be used for accurate boring and locating . . . Capacity ½" to 1" end mills in tool steel. Table working surface 8" x 26", 8" x 34" overall.

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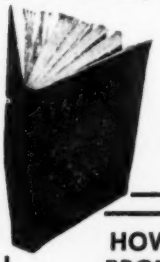

Here is a complete manual on every phase of punch and die work. Explains fundamentals, shows how to lay out, construct, and use punches and dies for specific jobs—according to standard practice of leading shops. Covers development of die design, use of metal stampings—data on sectional dies and big press work — blanking, notching, drawing, binding, forming, etc. **By F. A. Stanley, 4th edition, 583 pages, 731 illus., $6.75**

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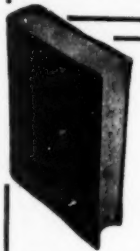

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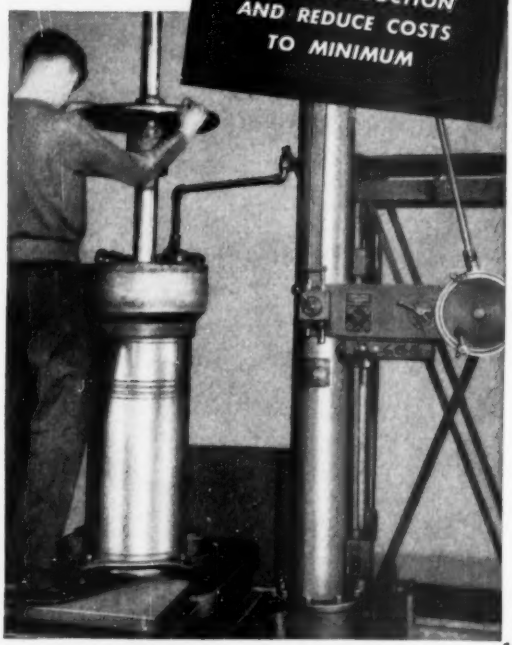

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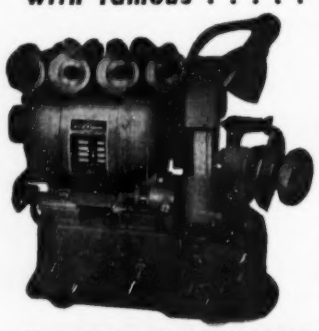

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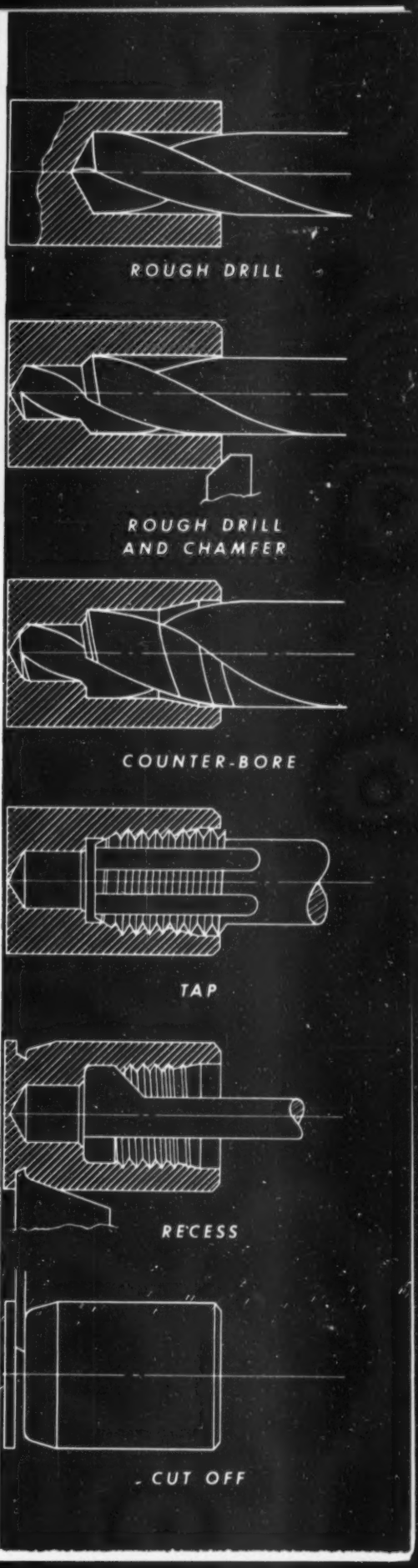


Ask ALCOA about threading and tapping aluminum screw machine stock

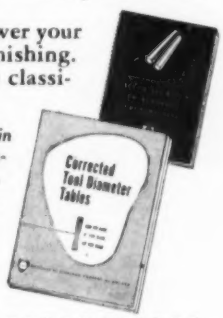
Cutting threads in aluminum is easy if you follow simple procedures of alloy selection, tool preparation and machine setup.

Where possible, use a die head with adjustable chasers rather than a solid die. Spiral taps are preferred to straight fluted taps, especially for deep-hole tapping operations.

Taps and dies remove a large amount of metal in proportion to their size. To reduce the load, have the blank or hole diameter of the part near the tolerance limit favoring the removal of the least amount of metal.

Both taps and dies should have a top rake angle ground on the leading edge of the tool. On some jobs, both taps and dies will cut better if a hook is ground along the leading edge of the lands to the third full thread, at about 5° to the axis of the tap or chaser. Tap flutes should be highly polished. Tap lands should be relatively narrow to reduce friction between the tool and the work.

Your local Alcoa sales engineer will gladly answer your questions on machining, alloy selection and finishing. You'll find him listed under "Aluminum" in the classified phone book.



ALCOA OFFERS TWO BOOKS—*Alcoa Aluminum in Automatic Screw Machines*—a 95-page book containing information on tool design, setup and operating techniques. *Corrected Tool Diameter Tables*—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0°, 5° and 10° top rake.

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In other sections of the File you will find additional catalogs containing useful information on a wide range of machine tools and accessories.

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Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

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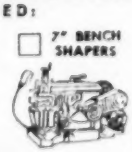

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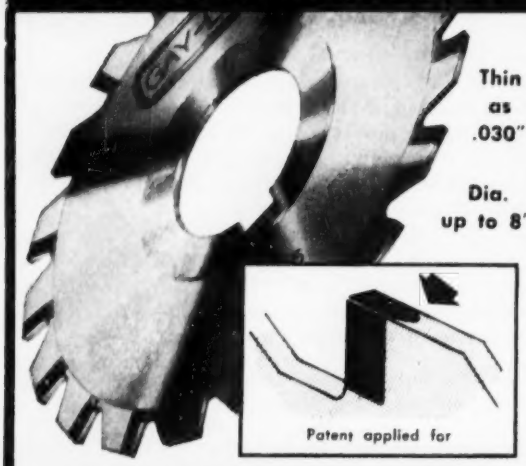

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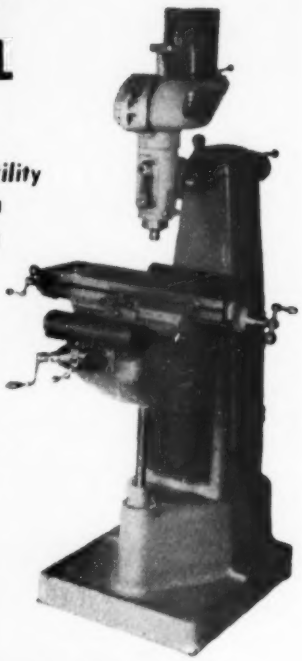

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Table size	8" x 24"
Longitudinal Feed	15"
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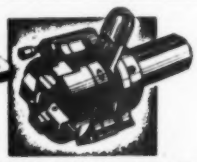

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NEW YORK HERALD TRIBUNE, MONDAY, AUGUST 24, 1953

Rebuilt Carrier Hornet Is Ready for Jet Age

By Jack Tait

The Navy aircraft carrier Hornet, toughened up to handle a brood of latest-type jet planes by twenty-seven months of exhaustive conversion at the New York Naval Shipyard, Brooklyn, will be recommissioned on Sept. 11, 178 years after the first Hornet, a sloop armed with ten nine-pounders, joined the then puny American navy.

Originally commissioned in 1943 and inactivated in September, 1946, the Hornet will be unveiled nexth month as a 1953 model which will cost the taxpayers one-third the price of a new carrier. Comdr. J. R. Newland, superintendent of the Hornet reconversion job, stood on the deck the other day and looked up at the Hornet and said, "she sure looks like a mess now, but we'll have her ready in fourteen working days."

"The Latest Thing Now"

"She's the latest thing in carriers now," Comdr. Newland said, "but Lord only knows how long she will stay that way. They keep coming up with new planes. They make the planes bigger and faster and heavier. Well, all we can do is to try to keep up with them."

Almost ready—Workmen on the flight deck of the carrier Hornet are busy completing the twenty-seven-month job of bringing the ten-year-old ship up to date. The hero of Pacific battles in World War II was decommissioned in 1946. When she is recommissioned at the New York Naval Shipyard, Brooklyn, on Sept. 11, she'll be tough enough to handle modern jet aircraft.

If the Navy will rebuild a carrier, it's logical to—

Do the same with your machine tools

Today's tough-to-machine alloys, carbide tooling, tighter tolerances and higher speeds put your machine tools in the class of a 1940 aircraft carrier.

Take a tip from the Navy. They saved time and the taxpayer's money by rebuilding the *Hornet* to jet age standards. If it can be done with a carrier, it can be done with your machine tools, no matter how large. You can save time and your stockholders' money by rebuilding your machine tools for today's tougher work.

Savings: 50% or more of the cost of a new tool.
Delivery time: a matter of weeks.

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- Machine is carefully studied to determine what must be done. Original manufacturer's specifications used as guide.
- All sliding surfaces checked for wear and refinished or replaced. (Ways, for example, can be replaced with new hardened steel ways, ground and hand-finished.)
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- Modernized features added, as required.
- When replacements for worn parts cannot be purchased, we design, machine and heat treat with our own equipment.
- Entire unit is repainted and assembled.
- Machine tool is tested and inspected under actual operating conditions and shipped only if it meets performance standards set by original manufacturer.

* . . . *or modernize them for greater speed and capacity if you wish.*

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AUTOMATIC, #0 B & S Wire Feed Screw, Late.
AUTOMATIC, Cleveland Model #B-1½" Spl. Spdl.
AUTOMATIC, #2 B & S Wire Feed, 1" screw. Cap.
AUTOMATIC, #4 Brown & Sharpe, M.D. Tooling

BALANCER, Anderson Bros. 14"x64", Rots-Checker.
BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 2¼" Lucas Horiz. M.D.
BORING MILL, Lucas Horiz., 3" Bar, M.D.
BORING MILL, Giddings & L. #0 Horiz. 3¼" Bar.
BORING MILL, 100" Niles B-P M.D. 2 swivel hds.
BARRELS, Tumbling Lupomatic, Schutte & Koerting.
BRAKE, #335 Chicago, M.D., Press 6' 15 ga., NEW.
BRAKE, #185 Chicago Power Apron, 8'3/16" cap.
BROACH, La Pointe 5 ton, 36" stroke, #1 Late.

COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 50 HP, M.D., 10x10, 278 CFM.
CRANE, OET Rieker 2 tons 11'9" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.

RADIAL DRILL, 3'9" Mueller, M.D.
RADIAL DRILL, 3'11" Canedy-Otto, M.D., Late.
RADIAL DRILL, 4'11" Cincinnati Bickford, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 30" Walker Turner M.D., Late.
DRILL, Fosdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2 M.D.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16".
DRILL, 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, 21" & 24" Cinci. Bick Super Serv. Box Col.
DRILL, Natco Multiple Spdle C5, 10 Sp. M.D.
DRILL, Natco Multiple Spdle #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S. #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #3 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
DEMAGNITIZER, SB-911 Magnaflux, late type.

FACING HEADS, 20" & 24" Mummert-Dixon.
FILER, #11-S Cochrane Bly Auto Saw Filer.
FILER, Type P4 Oliver Floor Type, M.D.
FURNACE, Westinghouse Elec. 18 KW. 2100° F cap.

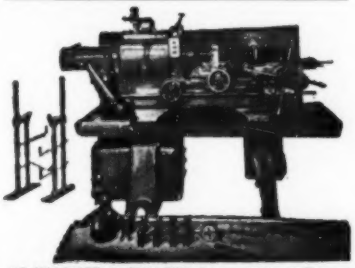
GRINDER, M.D. Sanford Surf. 6"x12" cap., New.
GRINDER, #1 Wilmarth Norman Hand Surf., 6"x12".
GRINDER, #2 Imperial Univ. Tool & Cutter, New.
GRINDER, #2 Brown & Sharpe Sur. 6"x18" cap.
GRINDER, #2 Cinci. Centerless Filmatic, Late Type.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #205, 18" Dble End.
GRINDER, Heald Rotary #25, M.D. 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Sur.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillpointer, #51.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4¼".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #80 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterholm Disc, 24" cap.
GRINDER, #7B, 72" Gardner Vert. Spindle. Late.
GEAR LAPPER, #8LS, #13LSI Fellows, Outboard Supports. Detachable Laphead. Late.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.

HAMMER, Rochester Hispeed, all sizes, M.D.
HAMMER, Bradley 2000# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.D.D. Cold 3/16".
INDUCTION HEATER, 16 KVA Ecco Hi Frequency
IRONWORKER, 1½ Buffalo Forge Univ. Coper & Notcher, 1951.
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.

4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

2—No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Preselector Head. Bar Feed 2⅛" cap & 4" capacity through spindle. Late Type, Motor Driven.

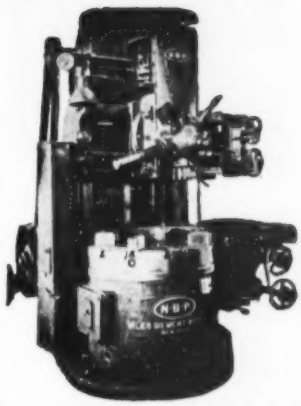


#2 WARNER & SWASEY Geared Head Turret Lathe, 12 Spindle Speeds, Bar Feed.

LATHE, Le-Swing 8"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, #6 WBL Reid Smallpiece Prod., Late Type.
LATHE, LeBlond 14"x8', Q.C.G., M.D.
LATHE, Hendey 14"x8' Q.C.G., Taper Attach, M.D.
LATHE, American 16"x6' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Reed-prentice 20"x10' Grd. Hd. M.D.
LATHE, 20"x16' Reed Prentice Grd. Hd., Late Type
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x10' Axelson Grd., Late, M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late
LATHE, Putnam 23/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Ledge & Shipley 28"x14', Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x16' Niles Timesaver, Grd Hd, M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, 42"x18' Pittsburgh Geared Head, M.D.
LATHE, Bullng Dble. End #VMTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #5 Warner & Swasey Univ. Late.
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret #3A Warner & Swasey Univ. M.D.
LATHE, #601 Oster Hand Turret, M.D., Late Type.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, #1-14 Kent-Owens Hyd. Late Type.
MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL, No. 1½ Milwaukee Plain Horiz.
MILL, #2 Kempsmith Maximiller Horiz., M.W. with Vert. Hd.
MILL, #0-8 Cinc. Vert. Prod. Rotary Table.
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3D Brown & Sharpe Vertical, M.D.
MILL, #3B K & T Horiz., M.D.
MILL, #3B K & T Vert. M.D.
MILL, #3VB Hardings Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0V Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinci. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-6 Auto. Prod.
MILL, No. 0 Brown & Sharpe Plain Horiz.
MILL, #0 Douglas Plain Horiz., M.D., Coolant.
MILL, #0 Sundstrand Rigidmill Hyd., Late Type.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL #0-8 Cinc. Horiz. Rise & Fall, Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical HI Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILL, 42"x96"x12" Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen Electric, 100 K.W.
NIBBLER, #196 Savage 36"x3/16" Cap., M.D.
NAILING MACHINE, No. 10—48"-54" Morgan, Late

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niels Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill. Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x28" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #2½ & #5 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 75 & 90 tons, New.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, #78½ Bliss Str. Side, 400 ton cap. M.D.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 68 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles-Bement-Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1¾" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. (" thru 1".

RIVET SETTER, #140 Chicago M.D., ¼" cap.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x¼" Lewn Initial M.D., New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Radlac "J" DeSanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #6 Marvel Bandsaw, 18"x18" cap.
SAW, #4B Marvel Hack Saw 8"x8" Cap., M.D.
SAW, #20-C Racine Shear Cut 8"x8" cap., M.D.
SAW, 10"x10" Racine Hyd., Late Type, M.D. #30C.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SAW V-26 DoALL Bandsaw, Late.
SHAPER, 16" Newark, Vise, M.D.
SHAPER, 16" Gould & Eberhardt V-ways, Vise, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, 32" Cinci., B.G., Motor Driven, H.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
THREAD ROLLER, #20, #30 Waterbury Farrel.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model QT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER, Type 03DR, Steel City.
WELDER, 500 amp. Westinghouse Flexarc A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WIRE STITCHER, Morrison & Acme, M.D.

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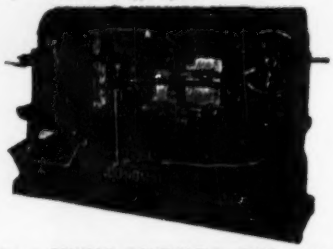
AUTOMATICS
2⅜" Cone 4 spdle., well equipped, 1936.
¼" Model F Gridley, 4 spdle.



2" 4 SPINDLE CONEMATIC, THREADING SPDLE., TAPPING ATTACHMENT, BAR FEED, CONSIDERABLE TOOLING. EXCELLENT CONDITION. 1943

BORING MILLS
#25RT G & L horiz., 1947, std. equip.
3½" Cinn. Gilbert floor type, late
24" Bullard New Era, rail & side head
36" Bullard New Era, rail & side head
42" Bullard New Era, rail & side head

GRINDERS
10x36" Norton type C, mech. infeed, late
#444 Van Norman rotary surface, 22" dia
#76RA Rogers knife grinder, 76", late
#104 Rivett Universal, 1942, rebuilt
#4 Bryant internal, auto. sizing
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
P & W deep hole drill grinder, late
Model 1311 P & W contour, late

DRILLS
4'11" Canedy-Otto radial, 1¾" cap., late
Type 14 Natco, 12 spdle., #4 M.T., inline head
#12 P & W, 9 spdle., #2 M.T., power feed
D-4 Colburn, #5 M.T., 3½" cap., 24" swing
Baker Hvy Dty, #5 M.T., p.f.
#2LMS Leland-Gifford, 26", hydraulic
#2 Allen, 2, 4, 6 spdle., #2 M.T.

GEAR MACHINERY
7A Fellows, shaper high speed, hvy dty
61A Fellows, shaper, high speed precision

LATHES
Connel Dengler spinning, 20" swing, 15 HP
14x36" Carroll-Jamieson, g.h., chucks, 1942
18"x46" Monarch 8 speed g.h., taper
42"x26' ctrs American, High Duty, 16 speeds
30"x10' American geared head, taper att.
48"x35' LeBlond Hvy Dty, taper, late
Gisholt Simplimatic, platen type, late

TURRET LATHES
#3 J & L Univ. bar feed, 2" hole, late
#5 B & O Univ., chuck, pre-selector, late
#1A W & S Univ., 3" hole. #417,756
#1L Gisholt Universal, 3" hole, 1937
Libby type H, 24" swing, 8 spdle, speeds
#2 Simmons Microspeed, air chuck, late
#3 Gisholt Universal, late
#4 W & S, bar feed, serial #342461
#4A W&S Univ., cross sliding turret, 1944

SHAPERS & PLANERS
30"x30"x17' Cleve. Openside
48x48x14' Detrick & Harvey dble. hsg.
48x48x16' Liberty openside, p.f.
26" Smith & Mills shaper, 4 step cone

MILLS
#12 B & S auto. prod., 5 HP, late
#3 B & S vert., s.p.d.
08 Cinn. horiz., rise & fall, 1943
08 Cinn. horiz., auto. cycle, 1943
#1½B K & T horiz., dble. overarm, rebuilt
10C Van Norman Contour
#3 Cinn. high speed dial type, vertical
#5B R & S horiz., round overarm, 16 speeds

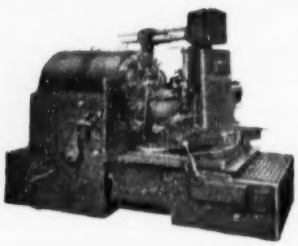
THREADERS
#22 Murchey bolt & pipe, ½ to 2", late
8x16" Hanson-Whitney Universal, mill, late
6x80" P & W miller, splining & milling
#50 Excello Precision grinder, 28x68"
13" Automatic Machinery miller, late
LT636 Lees Bradner mill, 18 x 36", late
1½" Landis, 2 spdle., lead screw type
#31 Excello, diamond dresser, late

PRESSES
#37 Excelsior dble. crank, 45 ton
250 ton Elmes hyd. shell nosing, 21½" str
Ferracute type EG-52 embossing, 150 ton
#4 Toledo OBI, 25 ton, 2" stroke

MISCELLANEOUS
MAGNAFLUX: MA-3 production type, 3000 amp
WELDER: 75KVA Thompson Gibbs spot, 18" throat
WELDER: 250 KVA Federal spot, air, late
TUBE BENDER: R-48 W & W hyd., 1¼", late
TAPPERS. Haskins 2CAM, 5/16" late
Cleve. Model EO, ½", late
WELDERS: Hobart and P & H Arc, 400 amp.
BULLDOZERS: #2 Ajax High Speed, 30 ton
SAW: 34" Espen-Lucas, 1945

T. R. WIGGLESWORTH MACHINERY COMPANY
1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO

LAURENS
late models



No. 17 GLEASON Spiral & Hypoid Bevel Gear Grinder, 1944 Machine hardly used, and in condition like new; with automatic wheel dressers.

LISTED BELOW IS A GROUP OF THE MANY FINE GEAR MACHINES AND LATHES IN STOCK:

2—KOEPFER Precision Gear and Pinion Cutters, up to 2" diameter, Model WM 1.

1—No. 61A FELLOWS Gear Shaper, Ser. No. 22198

1—Model No. 725 FELLOWS High Speed Gear Shaper, Ser. No. 17144.

1—12" GLEASON Combination Rougher and Finisher for straight bevel gears, hydraulic chucking, Ser. No. 15459.

1—10" PRATT & WHITNEY 2-wheel Helical gear grinder, Ser. No. 204

4—No. 18 GLEASON Formate Hypoid Gear Grinders, like new, Ser. Nos. over 22,000, new 1947

1—12"x30" cc LEBLOND Heavy Duty Toolroom Lathe, Ser. No. NB-201

1—20"x96" centers LODGE & SHIPLEY Engine Lathe, with taper attachment, late style, Ser. No. 31068

1—Model U SENECA FALLS Lo-Swing 14"x 24" centers Automatic Lathe, Ser. No. 25U-5355

1—20"x25" JONES & LAMSON "FAY" Automatic Lathe, with air chucking, Ser. No. 80855

2—Model 816 CLEVELAND Rigidturners, like new; Ser. Nos. 88T-38 and 88T-46

Telephone REdwood 3500

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MACHINERY FOR SALE

Brown and Sharpe Hobber, No. 44, serial No. 104 with Crocker Wheeler Motor, serial No. 748275. Equipped to cut spur and spiral gears and splines.

Schuchardt and Schutte Hobber, 36" CAP TP #2, serial No. 6706. Equipped with differential for cutting spur, spiral, and worm gears.

60" Reinecker Hobber, RF No. 4N, Serial No. 6937/1. Completely rebuilt. Equipped with Tangential feed and differential.

These hobbers now being used in production and in excellent condition. Can be seen in operation.

1—Monarch Lathe 12" and serial No. CK 3919.

1—Monarch Lathe 14", serial No. C-5239.

All of the above equipment motorized, 220 volts AC, 3 phase.

FS-8480, AMERICAN MACHINIST
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12x68" PRATT & WHITNEY Thread Miller
32" KING Vertical Boring Mill
BROWN & SHARPE Automatics (several)
W.F.F. Double Action Power Presses
#08 CINN. Vert. with Rotary Table
30" ESPEN-LUCAS Hydraulic Cold Saw
#2A WARNER & SWASEY Turret Lathe
#1 W.F.F. Screw Slotters
#2 B&S Univ. Grinders, C&S, Tooling
HASKINS #2 Cam Tapper, Index Fixture
#4 TORRINGTON 4 Die Swager
Numerous Other Machine Tools

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Eastern Rebuilt Machine Tools

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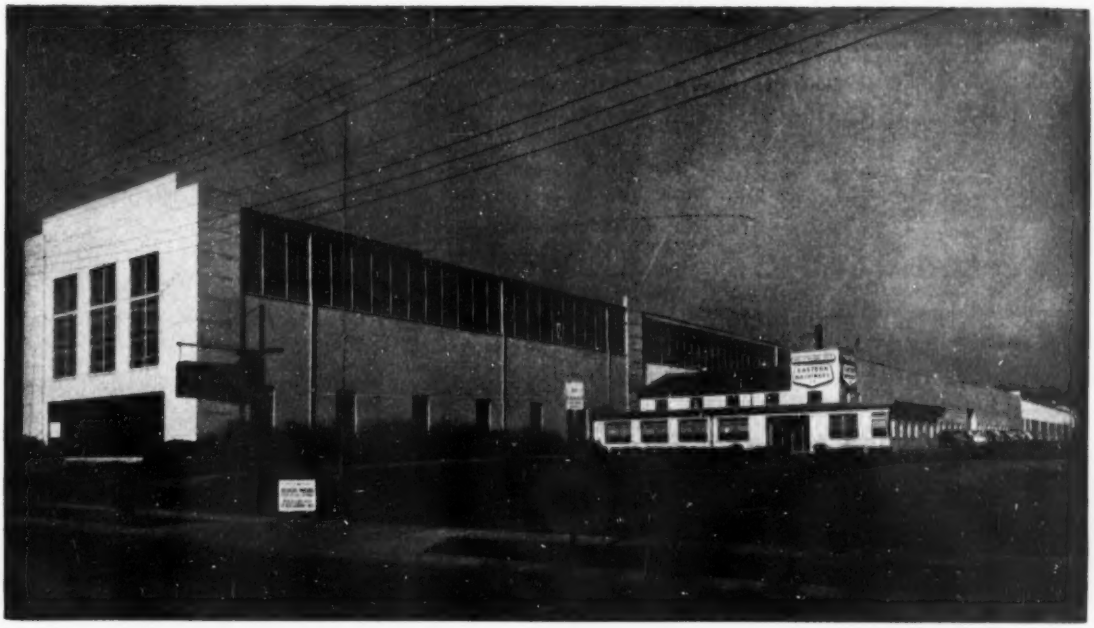

MULTIPLE SPINDLE DRILLS

#115U Moline Multiple Spindle Drill Press
No. 3 Baush, m.d., 16x30" head
No. 3 Baush, m.d., 20x40" head
No. 16 Foote-Burt Fixed Center, m.d.
3 spindle Rockford Gang Drill, m.d.
3 spindle 24" Barnes All Geared Self-Oiling, m.d.
3 spindle 28" Cinti. Bickford Upright Drill, m.d., No. 4 Morse Taper
4 spindle Niles-Bement-Pond, m.d., 12' rail, No. 5 Taper
No. 924 W. F. & John Barnes Vertical Drilling, Boring, Facing & Reaming Machine

UPRIGHT DRILLS

D6 Colburn Heavy Duty, m.d.
21" Cincinnati, belted m.d.
24" Aurora, belted m.d.
24" Cincinnati-Bickford, m.d.
24" extended to 36" Cincinnati-Bickford, m.d., upright sliding head
26" Aurora, m.d., taper
32" Aurora, belt drive
36" Cincinnati-Bickford, belt drive
No. 2 Colburn Mfg. Type, belted m.d.
No. 315 Baker Heavy Duty, s.p.d.
No. 417 Baker, m.d., later type
No. 513 Baker, m.d.
#4—48" Defiance Machine Co. Drill, m.d.
No. 16 Foote-Burt Hydraulic Piston Type Single Spindle Prod. Drill, m.d.
No. 242 Barnes All Geared Self-Oiling Drill Press

GEAR SHAPERS

No. 12 Fellows Gear Shaving Machine, m.d., late
No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 6i Fellows, belted m.d.
No. 6i Fellows, gear box, m.d.
No. 6iA Fellows, m.d., latest type
No. 648 Fellows, m.d.
No. 615 Fellows, m.d.
No. 615A Fellows, m.d., late type
No. 64A Fellows, m.d., latest
No. 645 Fellows, belt
No. 75 Fellows, m.d.
No. 712 Fellows, m.d.

GEAR CUTTERS

Gleason Spiral Bevel Gear Rougher, m.d.
3" Gleason Gear Generator, m.d.
8" Gleason Straight Bevel Gear Generator, m.d.
11" Gleason Straight Bevel Gear Generator, m.d.
Cincinnati Gear Burnisher, m.d.

GEAR GRINDING MACHINES

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical
No. 13LS Fellows Gear Lapper, m.d.
5G11 Gear Grinding Machine, m.d., latest
GG19 Gear Grinding Machine, m.d., latest
GG31 Gear Grinding Machine, Internal Gear & Spline Grinder, m.d.

GEAR HOBBING MACHINES

Type A Barber-Colman, m.d.
No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 12 Barber-Colman Double Overarm, m.d.
No. 12 Barber-Colman Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, m.d., Spur & Spiral
Pfauter Gear Hobber, Model RS 1, m.d., new
No. 3 Newark Gear Hobber, Plain Type, m.d.

GEAR TESTERS

No. 1 Brown & Sharpe Spur Gear Tester
12" cap. National Broach & Machine Co.
18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.
No. 471 Michigan Tool Co. Hob, Reamer, & Gear Checker

AUTOMOTIVE GRINDERS

Kwik-Way Model H Piston Turning & Grinding Machine, m.d., late
No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d., late

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 3/8" valve stems, m.d.

DISC GRINDERS

Model 120A Gardner, double spindle, m.d.
No. 2 Gardner, belted m.d.
No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
14A Gardner Grinder, m.d.

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK AUTOMATICS, BOLT THREADERS, BORING MILLS, RADIAL DRILLS, BALL BEARING DRILLS, HORIZONTAL DRILLS, BROACHING MACHINES, GRINDERS, HONING MACHINES, ENGINE LATHES, MFG. LATHES, MILLING MACHINES, PIPE MACHINES, PRESSES, PUNCHES & SHEARS, PLANERS, SAWS, RAILROAD MACHINERY, SHAPERS, SLOTTERS, TAPPERS, SHEET METAL MACHINERY, TURRET LATHES, ETC.

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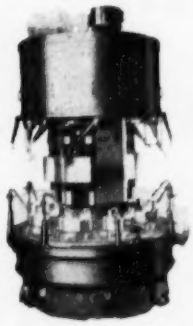


BULLARD MULT-AU-MATIC

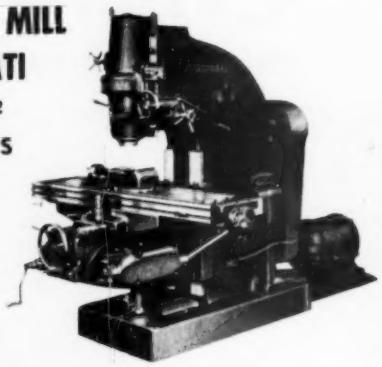
16" 8-Spindle, Type D, Single Indexing. Complete with electrics.

SPECIFICATIONS

Standard power-operated chucks. Arranged for coolant with piping & splash guards.

Hi POWER VERT. MILL #4 CINCINNATI

Ser. No. 8A 4V 1L-2



SPECIFICATIONS

Table working surface 68" x 19"

Range:
Longitudinal 42"
Cross 18"
Vertical 16"
Head Travel 6"

Spindle—Chrome-nickel steel. (Standard flanged spindle nose with No. 50 series taper hole.) Spindle speeds—16 Range 17 to 480 rpm. Spindle reverse. Power Quick Traverse. MOTORS: 15 HP, 3/60, 220 V, 1750 rpm.

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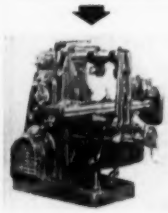

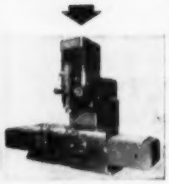

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BORING MILLS

BULLARD 42" Vertical Boring Mill; ser. #14,777; side head; M.D.
BULLARD Type "A" 8" Mult-Au-Matic; 6-spdl; serial #10884; M.D.

DRILLS

LELAND-GIFFORD No. 2LM8 2-Spindle; hyd. picker type feed; M.D. (Late).
BARNES 24" All-Geared; Self-Oiling; M.D.; Single Spdl.
DELTA 4-Spindle 17" Drill; power feeds; M.D.

GRINDERS

TAFT-PIERCE No. 1 Precision Surface Grinder; 6 x 12"; tilting head; M.D. (Late).
ARTER Model A-12 Rotary Surface Grinder; 14" chuck; M.D.
BLANCHARD No. 16 Surface Grinder; 26" chuck; M.D.
HAMMOND 14" Carbide Grinder; M.D. (Late).

LATHES (Turret)

JONES & LAMSON #4 Univ. Geared Head; bar feed, collets; chuck; lots of tooling; (LIKE NEW).
GISHOLT No. 4 Univ. Geared Head; preselector; M.D. (1942 mfg.).
SIMMONS No. 3 Micro Speed; geared; M.D. (Like New).
FOSTER No. 3B Saddle type; 5" spindle; M.D.; Geared Head; tooling.
WARNER & SWASEY No. 1 Hand Turret Lathes; bar feed; M.D. (1941 mfg.).

MILLS

BROWN & SHARPE No. 2B Horizontal Mill; late model; vertical head.
VAN NORMAN No. 12 Univ. Horiz/Vert. Mill; M.D. (Late).
VAN NORMAN No. 1-18 Production Mill; M.D. (LATE).
KENT-OWENS No. 2-RV Hand Mill; M.D. (LATE).

PRESSES

BLISS No. 103-A Double Crank; str. side gap frame; 2" stroke; bolster 14" x 42"; M.D. (1944 mfg.).
TOLEDO No. 201-E Dbl. Crank Gap Frame Geared; bed 13" x 53"; stroke 3⅝".
FERRACUTE No. P-2 Flywheel Press; M.D.
FERRACUTE No. P-3 Flywheel Press; M.D.
ZEH & HAHNEMANN No. 7 Embossing Press; 50-Ton cap.; M.D.
EXCELSIOR No. 20 Deep Throat Press; 28" throat; M.D.
RODGERS 150-Ton 4-Post Hydraulic Platen Type; LIKE NEW.

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Landis 26"x72" and 18"x96" Plain Ext. Grinders.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.G.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Rod Head Sp.
LeBlond 27"x12' Bed Grd. Hd. Q.C.G. Lathe 13" hollow spindle.
Norton 6x18" Horiz. Hand Sur. Grinder 1941.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 9" Bar Horiz. Boring Mill.
20" All Grd. Camel Back Drill 1-Sp. and Barnes.
Amer. 3' & Morris 3½' Arm Radial Drills.
Blanchard M.D. Vert. Sp. Surf Grinder 26" chuck.
Campbell No. 213 abrasive cut off 1947.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1947.
Nazel #3-B Vert. Air Hammer A.A. M.D.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Heald #79-A Rod Head Sp. Internal Grinder.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller, 2 Tables.
Foote-Burt # 2S Hex. Col. 1-Sp. Hvy. Drill.
L & N, 6', 10' & 12' Press Brakes.
Bullard 24" & 30" Vert. Turret Lathes.
Lynd-Farquhar 28" stroke openside Shaper Planer.

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American 16" High Duty Engine Lathe, 12 speed geared head, pan bed, swing 18⅛", 60" center, 2 chucks.
Cincinnati Bickford 4' Radial Drill, 11" column, motor drive.
Lucas #31 Horizontal Precision Boring Mill, motor drive.
Brown and Sharpe #4-B Heavy Plain Milling Machine—all geared head and feeds motor drive Timken Spindle.

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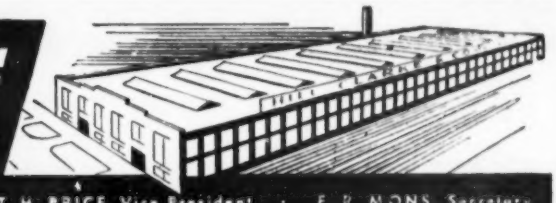

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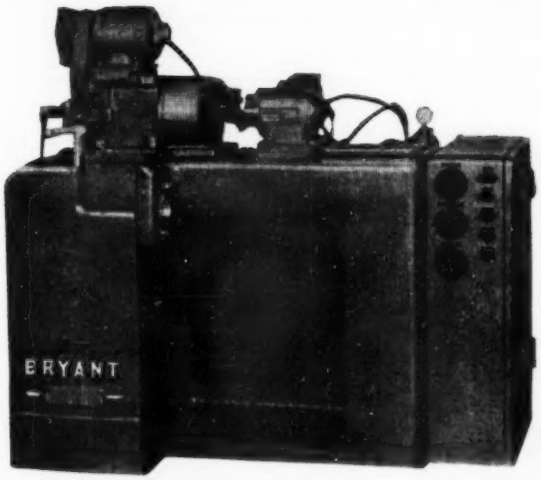

BEAUTIFUL CONDITION

LATE 1951 MACHINE

NO. 1109 BRYANT INTERNAL GRINDER

Total chuck swing 9 inches. Max. traverse stroke 6", max. grinding length 3½", self-contained electrical equipment with high frequency wheel spindle.

AUTOMATIC

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl.—14" Sw.—No. 2 Avey Cam Fd
1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl.—24" Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 64 Fellows Gear Shaper
No. 05 Fellows
8" cap Red Ring Gear Lapper

GRINDERS

6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 36" Norton Type C
10" x 36" Norton Type C Cam. Grdr.
10" x 48" Norton type C (1943)
Hill-Clarke Cylindrical Grinders
  10" x 36" centers
  10" x 72" centers
  10" x 96" centers
  14" x 36" centers
  14" x 50" centers
  14" x 72" centers
  14" x 96" centers
  18" x 96" centers
  18"-30" gap x 96" centers
  24" x 264" centers
No. A-3—12" Arter Rotary Surf.
No. 1109 Bryant Internal Grd. (1951)

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No. 5 Bryant Internal Grd.
No. 5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-A-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 16 A-28 Bryant Internal Grd.
No. 16 F-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

BORING MACHINES

54" Ingersoll Vert. Adjustable Rotary Mill
No. 45—4½" bar G & L Hor. Bor.
100" Niles-B-Pond Vert. Bor., Mill

LATHES

16" x 33" R-14 Seneca Falls Auto Lathe
18" x 6' American Geared Head Lathe
18" x 8' Lodge and Shipley
19"x8' LeBlond Mfg. Tur. Lathe
27" x 12' American Geared Hd. Lathe
27" x 12' centers LeBlond Lathe
36" x 18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7½" Hole Spdl.
No. 4A Warner & Swasey, Taper, (1944)
No. 4A Warner & Swasey, Taper, Cross-Slide (1942)

MILLING MACHINES

No. 3K Milwaukee Vert. Mill (1942)
No. 08 Cincinnati Vert. Mill (1942)
54" x 30" x 16' Ingersoll Slab Mill
6" x 168" Pratt & Whitney Thrd. Mill
10" x 48" Hanson-Whitney (1942)
10" x 60" Pratt & Whitney Thrd. Mill
12" x 102" Lees-Bradner Thrd. Mill

PLANERS

48" x 36" x 14' Gray, 2 hds.
48" x 48" x 12' Cincinnati, 2 hds.
60" x 48" x 27' American, 4 hds.

MISCELLANEOUS

No. 4B Marvel Hacksaw
Model No. 2 Micro. Horiz. Hone
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12" x 96" Magnetic Chucks
20' x 1" cap Southwark Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)

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LATE MODEL MACHINE TOOLS . .

AUTOMATICS
2" Model A Cleveland, 1941.
1-1/16" Model A Cleveland, 1943.
No. 00G Brown & Sharpe, 1941.
No. 0G Brown & Sharpe 1941

BROACHES
HP-100 La Pointe Horiz. Broach. 1943.

DRILLS
J-125-U Kaukauna Univ. Radial, 1947.

GEAR EQUIPMENT
No. 7 Gleason "Revax" Rougher, 1943.
No. 6 Gleason Revacycle Generator, 1946.
No. 72 Fellows H.S. Gear Shaper, 1942.
No. 61 Fellows Gear Shaper, 1942.
10" Pratt & Whitney Hyd. Gear Grinder, '42
SG-11 Geargrind Spline Grinder, 1942

GRINDERS
10"x18" Norton Plain Type "C", 1940.
6"x30" No. 12 B & S Hydraulic, 1940.
No. 72A-3 Heald Int. Extended Base, 1942
No. 72-A3 Heald Plain Hydraulic, 1942.
No. 24-36 Bryant Hydraulic, 1943.
No. 16A2R Bryant Hole & Face, 1942.
No. 172 Heald Hydraulic, Gap, 1940
A3—16" Arter Rotary 1943
No. 24D Hanchett Duplex Rotary, 1945.
No. 16A Blanchard Auto. Surface, 1942.
No. 2 Cincinnati Centerless Grinder, New 1944.
Cincinnati Centerless Lapper, 1942.
HRS Barber-Colman, 1942.
No. 35 Excello Precision Thread, 1942.
No. 7 Grand Rapids Universal, 1942.
No. 1 Brown & Sharpe Univ. 1940.

GUN BARREL MACHINES
No. ½ B x 50 P & W Reamer, Latest.
No. ½ B x 30 P & W Reamer, Latest
No. ½ B x 50 P & W Rifler, Latest.

LATHES, ENGINE
27"x192" Niles Timesaver, 2 Carr, 1941
27"x96" Niles Timesaver, 1940.
16"x180" Betts Bridgeford, 1949.
18"x72" Cincinnati, 1947

LATHES, PRODUCTION
9"x84" Le-Swing Semi-automatic, 1941
No. 3A Lodge & Shipley Duomatic, 1942
No. 1FU Foster Fastermatic, 1942

LATHES, TURRET
36" Bullard VTL, Spiral Drive, Late.
No. 1L Gisholt Saddle Type, Late.
1A Warner & Swasey Saddle type, 1941
No. 2A Warner & Swasey Saddle Type, 1940
No. 3R Gisholt Universal Saddle Type, 1943
No. H5 Libby Universal Saddle Type, 1948.
No. 5 Gisholt Universal Ram Type, 1942.
No. 4 Gisholt Universal Ram Type, 1940.
No. 2M-50 Warner & Swasey Ram Type, 1941

MILLS, BORING
No. 41 Lucas Horiz. 1941.

MILLS, PRODUCTION
No. 1-18 Cincinnati, 1942.
M-18 Milwaukee, 1943.
No. 00 CINCINNATI Rise and Fall, 1942
8x18 Hanson-Whitney Thread, 1939.

MILLS, TOOL ROOM
No. 3 Cincinnati Univ. Dial Type.
No. 2 Salmo Vertical New.
No. 2 Salmo Universal, New.
No. 3 Salmo Plain & Vertical, New
No. 4 Salmo Vertical, New.

PRESSES
Verson 650 Ton Double Action, 1940
No. 166½ Toledo Toggle.
No. 166 Toledo Toggle.
No. 67 Bliss Consolidated Press

SHAPERS
32" Ohio Heavy Duty Univ. 1951
16", 20", 24" Gernetti Universal Shaper, New.

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

LATE TYPE SLOTTERS

12" Dill Travelling Head. New 1941. With 24" indexed table, six-speed, A.C. motors. *Condition equal to new.*

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990A Broad St., Newark 2, N. J.

X-RAY MACHINE

Gen. Elec., Industrial No. KX3, w/lead Lined Booths & Tube Col., New 1935.

ZAKROFF MACHINERY CO.
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BRAND NEW—AT REDUCED PRICES

Size 30 x 30. Well-known manufacturer. Process superior to other metal surface treatments—New principal employed. Especially suitable for removing organic and inorganic coatings, plating, and heat treat scale. Replacement parts guaranteed.
$885 per machine
FS-9583, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

Watson Stillman Right Angle Hydraulic Press—capacity 75 ton vertical and 225 ton horizontal, with pump and motor (1942)
Lodge & Shipley Model "X" Heavy Duty Engine Lathe — 25" swing, 168" centers, completely equipped (1951)
Buffalo #3 Horizontal Bending Roll—6"x6"x⅞" Angle, complete with motors and controls (1951)
FS-9566, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

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SAVE 50% ON NEW HIGH SPEED TAPER SHANK END MILLS

Right Hand Spiral Flute End Mills with Brown & Sharpe Taper Shanks

7/16 Dia. #5 B&S Taper $1.50 ea. net
½ Dia. #7 B&S Taper 2.00 ea. net
¾ Dia. #7 B&S Taper 2.50 ea. net
1 Dia. #7 B&S Taper 3.50 ea. net
1½ Dia. #9 B&S Taper 6.50 ea. net
1¾ Dia. #9 B&S Taper 8.00 ea. net

High Speed Extra Long Flute End Mills. R.H. Cutter, 1" Dia. #9 B&S Taper 6" Flute Length, Left Spiral Flute . . . $5.00 ea. net.

High Speed Right Hand End Mills Spiral Flutes with Morse Taper Shanks

⅜ Dia. # 1Morse Taper 5½ O.A. 1.65 ea. net.
½ Dia. #2 Morse Taper 1.75 ea. net.
¾ Dia. #2 Morse Taper 2 Flutes 2.50 ea. net.
1¼ Dia. #2 Morse Taper 4.00 ea. net.
1¼ Dia. #3 Morse Taper 4.80 ea. net.

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MORE THAN 60% SAVINGS

Natco Horizontal Way Type Drill—Mult. Spindle Hydraulic Feed—Model 17U1—Late Type—M.D.

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Central 6-3229

No. 2 B & S High Speed Autos. M.D.
No. 25 Heald Rotary Surface Grinder.
P & W 30" Vert. 2-spindle Profiler.
Peerless 6½" x 6½" Hack Saw, hyd.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

this Searchlight Section of

American Machinist

is an index of reliable sources for Used and Surplus Equipment Supplies now available. Consult the *Searchlight Section* in following issues for later offerings.

If you don't see what you want—ask for it. Ask the advertisers. They are constantly adding to their stocks and may have acquired just what you need.

And, when you have special items to dispose of, use the Searchlight Section of American Machinist to help you locate buyers. . . . Send a list of your equipment and we will gladly give information as to space and rates.

Classified Advertising Division

American Machinist

330 W. 42nd St. New York 36, N.Y.

1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS
VAN NORMAN: 10CT Contour Miller horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES
SWEDISH: Double-End, 42" & 60", new
SUNDSTRAND: Double-End, #53, 24" Centers.

CUTTER & TOOL GRINDERS
ARTER: Carbide Tool Grinders No. 200
CONSTAN: Carbide Tool Grinder No. 178, new
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES
ALLEN: No. 2 Drill—6 Spindle
ALLEN: #2 High Speed 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' and 7', new

GEAR CUTTING MACHINES
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10" x 24" Hydr. Spur Gears and Splines
INTERNAL GEAR GRINDER, GG-31

GEAR FINISHERS & TESTERS
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 3 Bevel Gear Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL
BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain

3-WAY GUARANTEE
1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

GRINDERS—CENTERLESS
#73 Heald Centerless Internal Grinder

GRINDERS—GEAR & SPLINE
GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

GRINDERS—INTERNAL
BRYANT: 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS
VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649-16, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—THREAD
EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
TRIPLEX Tool Room Lathe, 14"x60", new

LATHES—TURRET
WARNER & SWASEY: 1A & 3A
WARNER & SWASEY #3 & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES
CINCINNATI: Hydromatic Duplex Rise & Fall, Model 34-36, Tracer Control
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed

THREAD MILLERS & TAPPERS
HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ⅛" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES
HEENAN & FROUDE 4-slide machines, new
HEENAN & FROUDE Paper Clip & Staple Machs., new
Nilson #1F, 4-slide wire forming

MISCELLANEOUS
ARTER CARBIDE Tool Grinders, No. 200
OPTICAL PROFILE GRINDER, Wickman, New
OPTICAL PROFILE GRINDER, Sheffield, used
AUTOMATIC SCREW MACHINE, Swiss type, ⅜"—used
AUTOMATIC SCREW MACHINE Wickman, Single Spindle, 7/16", New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe 12" dia. x 48" centers
HARDNESS TESTER: Gogan Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
SWEDISH, Double-End, 42" & 60", new
SUNDSTRAND: Double-End, #53, 24" Centers
WIRE FORMING MACHINES: 4-slides (new)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

WHY SEARCH?

AUTOMATICS
No. 00G Brown & Sharpe, serial 6376
1½" 6-spindle Conomatic, Timken
7" 6-spindle Baird chucker, Model 76H

BORING MACHINES
3½" Cincinnati Gilbert floor type, 1942
No. 48 Heald Bore-matic

BROACH
15 ton 36" Colonial vertical surface
10 ton 48" American horizontal hydraulic

DRILLS, Hy. Dy.
20" and 24" Baker box column

DRILLS, Multiple
34" spindle No. A16 Natco

DRILLS, Sens.
No. 2 Allen drill and tapper

DRILLS, Radial
3½ ft. American, motor on arm

DRILLS, Misc.
Natco double end hydraulic, 1947, 6 station

GEAR HOBBERS
Two type A Barber colman
No. 7B Lees Bradner
72" Schuchardt & Schutte, tangential feed

GRINDERS, Centerless
No. 2 Cincinnati

GRINDERS, Cyl.
10"x18" Cincinnati plain Filmatic
10"x36" Norton semi auto.

GRINDERS, Disc.
20" No. 120A Gardner, 1947

GRINDERS, Int.
Nos. 5, 16A and 2436 Bryant
72A3 Heald Gagematic and Sizematic

GRINDERS, Surf.
8"x24" No. 5B Brown & Sharpe, late

GRINDERS, Radius
42 Van Norman

HONES
No. 172 and 2810 Barnes vert. hydr.
No. H2 Micromatic, 1941

LATHES, Eng.
14"x42" Hendey, late
24" x 14 ft. American geared head

LATHE, Mfg.
20"x25" Fay automatic, 1942
No. 6 LeBlond Multi-Cut, 1941
14"x10" Lips Carbo-Lathe

LATHE, Turret
No. 3A Warner & Swasey, 1941
5½"x18" swing Libby, late
36" Bullard vertical

MILL, Plain
No. 2 Cincinnati H.S. dial
No. 3B Van Norman H.S. dial

MILL, Prod.
No. 436 Cincinnati Hydromatic
48"x36"x12 ft. Ingersoll adjustable rail planer type

MILL, Spline
4" M80 Taylor & Fenn

MILL, Thread
8"x18" Hanson Whitney 1941

PLANER
36"x36"x8 ft. American

PRESS
15 ton Dennison hydraulic

RIVETERS
Large assortment, ⅛" to ⅝"

SAW
13" Peerless Universal Hack

SHAPER
16" American Auto oiled

ROLL
20 ft. x 3/16" Farnham

SLOTTER
24" Niles Bement Pond

TESTER
50,000 lbs. Baldwin Southwark Tate Emery

THREAD ROLLER
3/16" National Pres.

WELDER
100 KVA Thompson Automatic spot

Write for complete catalog

MILES MACHINERY CO.
Saginaw, Michigan Phone 23105

FINE LATE TYPE GUARANTEED TOOLS

16"x78" centers **PRATT & WHITNEY** Model "C" Toolroom Lathe, taper attachment, chucks, new 1943

28"x15' centers **BERTRAM** (Niles patterns) "Timesaver" Engine Lathe, 2 carriages, rapid traverse, AC-MD, new 1943

36"x12' centers **AMERICAN** Heavy Duty 16 Speed Geared Head Lathe, AC-MD

60"x20' **NILES-BEMENT-POND** Geared Head Engine Lathe, rapid traverse

No. 5 **GISHOLT** Turret Lathe, Bar feed and Chuck, New 1943

No. 1L **GISHOLT** Saddle Type Universal Turret Lathe, preselector head, bar feed, chuck, new 1943

No. 1A **WARNER & SWASEY** Universal Turret Lathe, Timken spindle, electric chuck

No. 2A **WARNER & SWASEY** Universal Turret Lathe, preselector head, bar feed, chuck, new 1943

No. 3A **WARNER & SWASEY** Turret Lathe, Timken spindle, electric chuck, tooling

No. 2 **CINCINNATI** Vertical Mill, dial type, New 1945

No. 2 **VAN NORMAN** Plain Horizontal Mill. New 1943

No. 2CH **KEARNEY & TRECKER** Vertical Mill, new 1951

No. 3-24 **CINCINNATI** Plain Hydromatic Mill, AC-MD

No. 4 **KEARNEY & TRECKER** Plain Horizontal Mill, No. 50 taper, motor in base, rapid traverse

No. 4 **CINCINNATI** High Speed Dial Type Plain Horizontal Mill, new 1942

No. 4 **CINCINNATI** High Power Dial Type Vertical Mill, 25 HP motor, new 1951

No. 4H **KEARNEY & TRECKER** Vertical Mill, new 1944

3¼" bar **LUCAS** Table Type Horizontal Boring Mill, vertical milling attachment

48"x48"x10' **NILES** Double Housing Planer, box table, DC reversing motor drive.

48" widened to 69"x12' **DETRICK & HARVEY** Double Housing Planer, box table, DC reversing motor drive

No. 16 **BLANCHARD** Rotary Surface Grinder, 28" magnetic chuck, AC-MD

No. 2 **BROWN & SHARPE** Surface Grinder, motor inside base, power feeds

25A Heald Rotary Surface Grinder, 24" diameter magnetic chuck, AC-MD

1½" **LANDIS** Bolt Threader, leadscrews, AC-MD

30" **MORTON** Hydraulic Keyseater, new 1942

600 Ton **CHAMBERSBURG** Wheel Press, cast steel frame, inclined, AC-MD

O'CONNELL MACHINERY CO.
Tel: BAlley 5800
1695 GENESEE ST. BUFFALO 11, N.Y.

BENNETT MACHINERY CO.

GUARANTEED MACHINE TOOLS
BORING MILLS, 42" King, Side Hd., New 1942
72" King, P.R.T., M.D.
100" & 72" N.B.P., 2 Hds., M.D.
4" bar Sellers Tble., 56" to outer support
3¼" bar Bullard, Table (2)
BRAKE, 10'x3/16" D & K, No. 4510D, Press
RADIAL DRILL, 5'15" col. Amer., Motor-on-Arm
GRINDER, CYL., 18"x144" Norton, M.D.
GRINDER, 16"x96" Landis Hyd., Late
LATHES, 48"x20' & 24' beds Niles (2)
42"x28' bed L. & S., T.A., 18 speeds, M.D.
36"x32' con. Putnam Grd. Hd.
24"x12' bed B. & E., T.A.
18"x12' bed L. & S., T.A., M.D.
14"x80" con. Amer., T.A.
SHAPERS, 32", 28", 24", 18" & 14", G. & E.

Rte. 3 Maywood Rd., Clifton, New Jersey
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OUTSTANDING MACHINE TOOLS

1000 LATE TYPE TOOLS IN STOCK

AUTOMATIC SCREW MACHINES:
ACME GRIDLEY 9/16" cap. Model RA-6 spindle; late.
CLEVELAND 3¾" model "A" single spindle; late.
GYROMATIC "Tavannes" #40, 6-spindle; late.

DRILLS, Multi-Spindle:
LeMAIRE 5-spindle, fixed head, motor drive.
FOOT BURT 6-spindle, fixed head, motor drive.
NATCO #14 Adjustable, #3 M.T., 18 spindle.

GEAR CUTTING EQUIPMENT:
BROWN & SHARPE #6-72" Auto. Cutter; M.D.
CROSS #1, 40, 45 Gear Tooth Rounder; M.D.
DETROIT type GG-35 Gear Grinder; late.
FELLOWS #6IA, 6Z2, 7S, 7A, 77, 48. H.S. Gear Shapers; late.
FELLOWS 13LS Lapper, motor-drive; late.
GLEASON 3" and 12" Straight Bevel Gen.; late.
GLEASON 3" spiral bevel gear gen.; M.D.
GLEASON 25" Straight bevel Generator; M.D.
GLEASON 24", 37" Bevel gear planers; M.D.
GLEASON #6 Revacycle; late type.
GLEASON #13 Hypoid cutter sharpener; late.
GLEASON #14 Spiral bevel Hypoid gear grinder; late.
GLEASON Model 17, Hypoid, Spiral Grinder; M.D. late.
GOULD & EBERHARDT 12H Gear Hobber; late
GOULD & EBERHARDT 18H Gear Hobber; M.D.
GOULD & EBERHARDT #36BM 3-spindle auto. gear rougher; M.D.
MICHIGAN Model 854 gear shaver, rack type; M.D.
MICHIGAN Gear Finisher, M.D., 867-24-A; late.
PRATT & WHITNEY 10" Gear Grinder; late.

LATHES, Turret:
GISHOLT 1L Univ. saddle type, Timken, M.D., late.
GISHOLT 2L High Production, Timken, M.D., late.
MOREY #2 ram type, Timken; late.
WARNER & SWASEY 2A Univ. Preselector head; late.

LATHES, Engine & Mfg.:
DENHAM 16" x 48" centers, Gap; late type.
DENHAM 12" x 54" centers, Gap; late type.
DENHAM 16" x 72" centers, Gap; late type.
HENDEY 14" x 30" centers, M.D., late type.
JONES & LAMSON "Fay" 20" x 25" auto; M.D., late.
LANG 12" x 42" grd hd Gap; motor-in-base.
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 14" x 30" centers, late type.
LODGE & SHIPLEY; No. 5-24" and 96" centers; DUOMATIC; Timken; late.
LeBLOND 4x60", 4x84", 5x60", 5x108"; late.
MONARCH 12" x 30" centers; Model CKK; late.
MONARCH 14" x 42" centers "Z" Magnamatic, Auto. Timken; M.D. late.
NILES 27" x 96" centers, Time saver, Timken; late.
NILES 30" x 48" Boring; "Time Saver"; late type.
SPRINGFIELD 14" x 43" geared; M.D.
SWIFT 16" x 72" centers; late type.
U.S. model 810B Cutter Reliever, 8" cap; late.

RADIAL DRILLS:
AMERICAN 5' arm 13" column, Univ., M.D.
CINCINNATI BICKFORD 6'15" Universal, M.D.
KITCHEN & WADE 4' arm 12" col., Plain, M.D.

Complete catalog upon request

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ELECTRIC FURNACE TO 1850°
with Auto Temperature Control. Sliding door. Cheap to operate. Substantial Dependable for Machine Shop, Tool Room.
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ATTENTION EXPORTERS
Unusual opportunity to procure modern Fellows Gear Shapers 615A and 845 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.
FS-1883, AMERICAN MACHINIST
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FOR SALE
1—Heald Sizematic, completely rebuilt by the Heald Machine Company within the last 90 days, serial No. 6887.
FS-8821, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

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AUTOMATICS
Brown & Sharpe (1) Model #4
Brown & Sharpe (1) Model 2G, 1¼" capacity.
Brown & Sharpe (8) Model 0G, ⅝" capacity.
Brown & Sharpe (4) Model 00G, ⅜" capacity
Brown & Sharpe #4 Automatic New 1939
Ceco Screw Machine ¾" capacity.
Cleveland Model AA-11, Serial #36586.
Cleveland Model B. Serial #42618/843.
Cleveland B18—1⅛" Cap. Late.
Conomatic 4 Spindle, Serial #2309FF, 1½".

BORING MILLS
Bullard 24" V.T.L. Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity
Defiance 3¾" Bar
Giddings & Lewis #32, 3" #25, 2½" Bar.
Kings 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mill

DRILLS AND RADIALS
American 6'x15" Universal, 4'13", 3'9"
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42 RPMSTERS
Canedy-Otto 21" Sliding head, New
Cincinnati Bickford 6'15" col.
Edlund 8" Model 2B, Sliding Head
Natco #12, 20 spindle. Model B2A—10 Sp.
24" Sibley Sliding head
New Geared Box Col. Drills 24"
Foote-Burt #25 3" capacity
Leland-Gifford 2 LMS, 3 MS
Leland Gifford No. 2—4 Sp. Hyd. Feeds
Sigourney 2 spindle

ENGRAVERS
Gorton #ME, 1D, 3U, 3Z, Deckel G1L, G1, G2
Taylor-Hobson 3 dimensional Pantograph
New, 3 dimensional Deckel type

GEAR EQUIPMENT
Barber-Colman Mod. SHS, Sharpener
Barber-Colman #3, #2, #12 (3) also Type S.
Brown & Sharpe #3 Gear Mill, 26" Cap.
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner, Flather 72" Cutter
Gleason Gear Rougher, Gleason #6 Power Tester
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
Michigan 1708 Hob & Cutter 8"x24"
Mikron No. 79 Gear Hobbers
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS, SURFACE
New 9x24" Hyd. Feed 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Brown & Sharpe #5, #2 with Chuck
Gallmeyer & Livingston—65
Heald 22—12" chuck, Arter 12", Covel No. 15
Portman 12" Chuck Rotary—Reid #3, 11"x36"
Pratt & Whitney 12x36" Vertical
Taft Pierce #1 Precision

HYDRAULIC EQUIPMENT
8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson & Stillman 20"x20" Platen 8" St. 19" opening
600 Ton Williams & White 42"x60"
800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press

All Hydraulic Equipment is completely engineered and checked by a competent staff thus assuring reliability.

Send us your Hydraulic problems.

GRINDERS, MISCELLANEOUS
Brown & Sharpe #2 Universal 14"x28", #3 Univ
Brown & Sharpe #5, 3"x18" Cylindrical
Brown & Sharpe #13 Universal Tool & Cutter
Bryant #5 Internal, chucking
Cincinnati 6x18" Hyd. #4—Centerless—#2
Douglas Tool & Cutter 8"x15"
Gardner Disc Grinder 30"—15 H.P. Motor
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder Mod. 375-2
Heald #73 Internal Centerless, #75A Internal
Heald 72A3 Int. Centerless Sizematic
J. & L. Thread; TG615, Lempco 54" Swing
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 10"x18" Type C cylindrical, 6"x30" Cyl.
Norton 14"x96" cyl. 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6-G Drill Grinder, 6G Tool, K.O. Lee tool
Van Norman #666 Crankshaft

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Bertram 26"x10'
Boyes & Emmes—24" G.H.—Bradford 16"x36"
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 14" Yoke
LeBlond Regal 10"x3' bed, 13x42"
LeBlond 25/50x96" Gap, Late type.
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
New 16, 18, 20", 28" Immediate Del.
New Tool Maker 10x24", South Bend 9"
Rivett Model 918 Precision, Mod. 715
Putnam, Sliding Gap 22"/46"x92"
South Bend 13"x5' Q.C.G., 10"x5 Q.C.G.
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.
New #2, Univ., Dividing Hd.
Brown & Sharpe #0 Omniversal, #000 Production
Brown & Sharpe #2B Plain, No. 2, 3A, 21, #2L
Cinn. 08 Rise & Fall 2-24 Automatic
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens IV, 1-8, 1-14, 1M, 2-20
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2H Universal, 2H Plain
Milwaukee #2B, Plain & Univ.
Nichols Horiz. Hand and Pneumatic Feed
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ., Dividing Hend

MILLS, VERTICAL
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, 08 Vertical
Cleveland No. 1 table 8"x32"
Gorton 8D Super Speed
Milwaukee 4K & 2K
Morey #12M Profiler, 2 sp. #2 Maximiller
New Manex 8"x24"
Reed Prentice Vert. Mill & Die Sinker Mod. 3VG
Taylor & Fenn Vert. 6"x18"

PRESSES
Bliss No. 1 Double Action Drawing Presses
Bliss 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss 5-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Horning, 15 Ton—Toledo 32 Ton Horning
Niagara A1¾, O.B.I., Niagara No. 27
Stokes Tablet Presses, Mod. R, RD3, RD35, DDS.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, L1 #3
Z & H #4½, O.B.I. 20 Ton

TURRET LATHES
Bardons & Oliver #2, 3, 5, 7 Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Foster #2B 2½ Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur.
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—9¼" hole in spindles
Libby 1 HS with threading att.—3R, 4R
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, 1A, 2, 2A, 3, 4, 5

MISCELLANEOUS
Band Saw: New Kalamazoo & Johnson
Bolt & Pipe Threader: Landis, Oster-Williams
Broach: New 6 Ton. Horizontal. 11 Ton. Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Jig Borers: New Swiss
Keyseater: Davis, Baker
Pipe Bender, Kane & Roach, Parker tube 1½" Cap.
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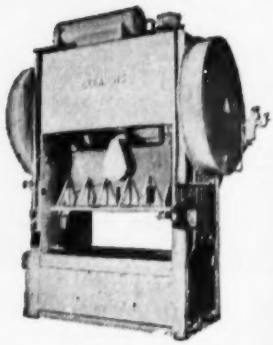

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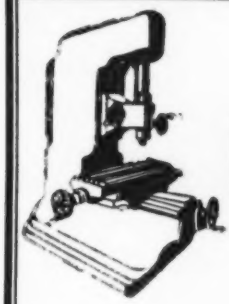

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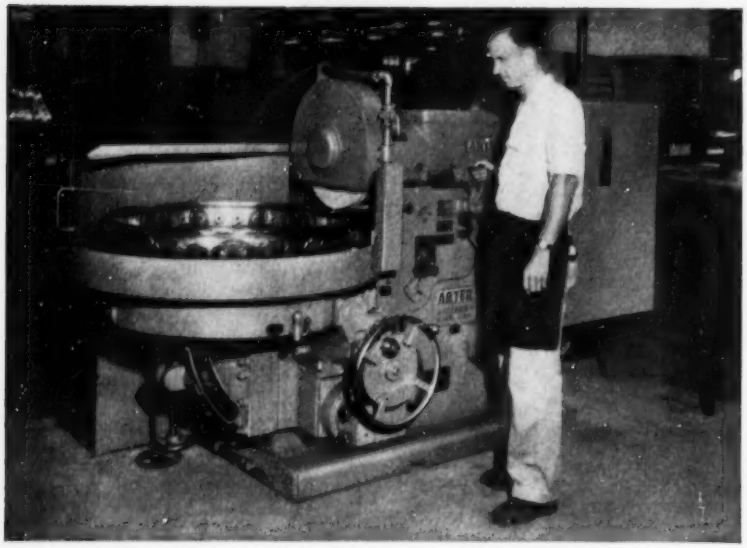

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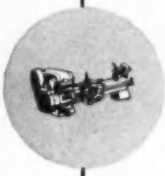

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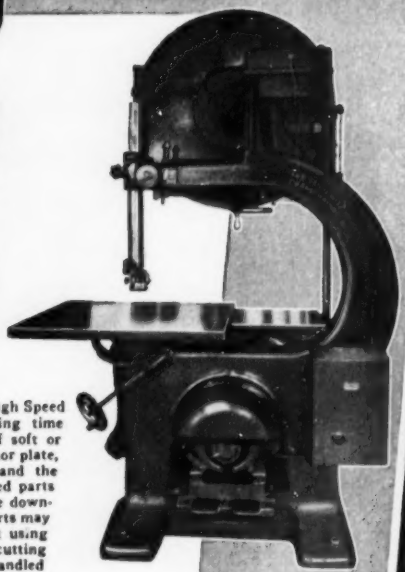

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During the past year, the Oakite Chemical Research Laboratory has produced 16 new materials for performing the following metal cleaning and processing operations:

1 **Heavy-duty cleaning in tanks**

2 **Etch-cleaning aluminum**

3 **Washing in pressure-spray machines**

4 **Electrocleaning zinc-base die castings**

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6 **One-operation cleaning, pickling and conditioning for painting**

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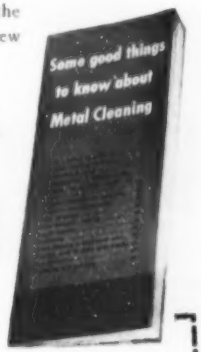

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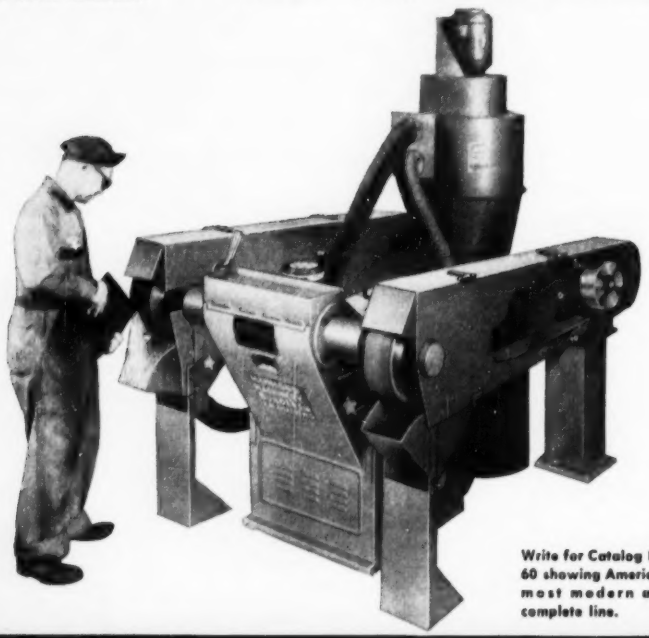

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DON'T put a worried man on a critical job. If safety is a function of flowless timing, the man with something else on his mind is accident prone. Give him a safe job for a while, until his sorrow, illness, financial ailments, or mental scramble can straighten itself out.

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Real estate was this plant's big location problem...

A manufacturer of machine tools looking for a location in the rich northeast market needed a single-story assembly plant with a fire-safe interior of approximately 40,000 sq. ft. A six-acre site for parking, shipping, and future expansion was required. Within a week, the manufacturer had complete information about several desirable plant sites, and was quickly able to close a satisfactory deal for his new plant. He had turned the details of his problem over to the best industrial fact-finding organization of its kind—the Industrial Location Service of the State of New York.

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No matter what your location problems may be, the Industrial Location Service of the State of New York will be glad to get you, confidentially and without obligation, the information you need to solve them.

YOU CAN GET AUTHORITATIVE DATA ON:

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Transportation: Availability of facilities, cost of assembling materials and distributing finished product between any given points.

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Community Services: A complete report on the facilities and attitudes of any community.

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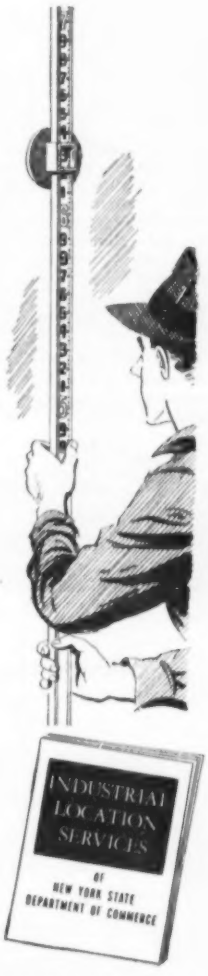

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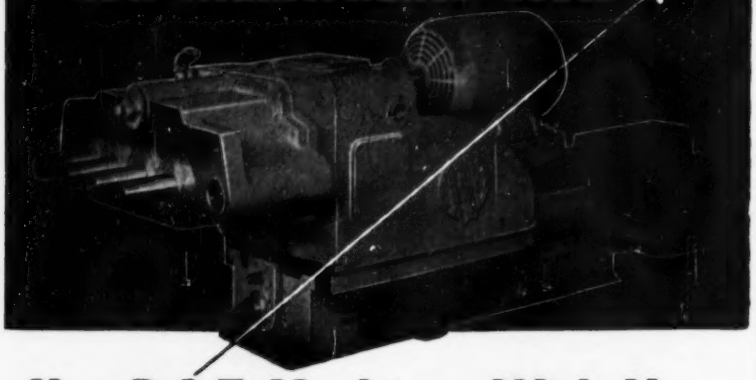

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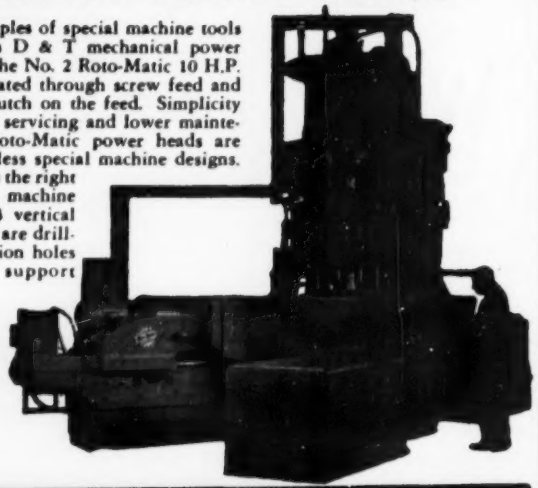

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is available on the complete line of D & T machines. Ask for Bulletin 1000.

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From the *American Machinist* Library of *Tips for Top Shop Men*

THE common belief that "perishable tools" are written off when they go out to the machine is one of today's most expensive notions. Unless control is exercised *in use* as well as in stocking, the machine, method or man that breaks or ruins an excessive number of tools is never spotted. In one test, ratio of tool use on two machines of the same type on the same job was 1 to 7.

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SET NEW PRODUCTION *Records!*

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No. of pieces per grind	8	250 (average)
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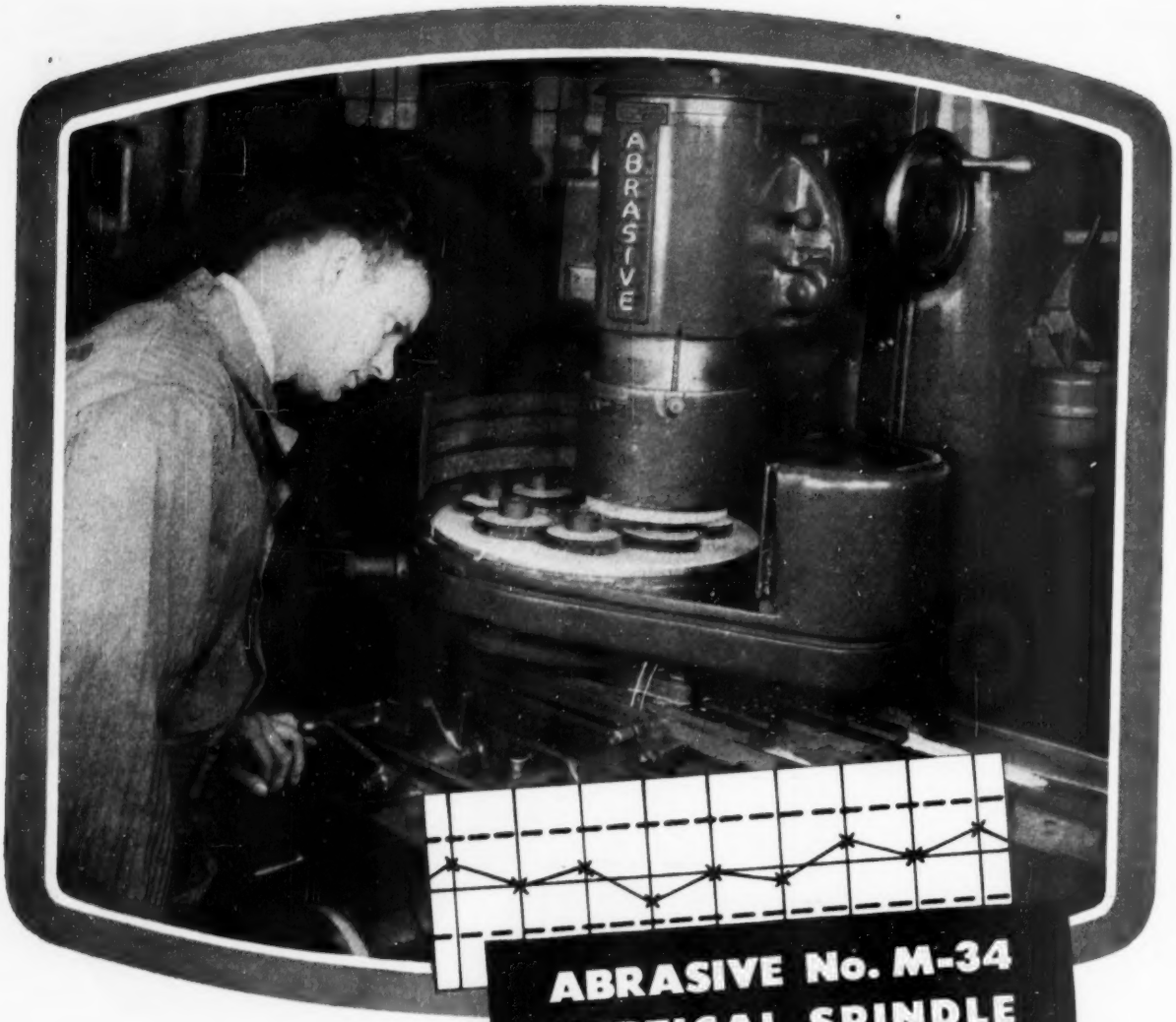

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